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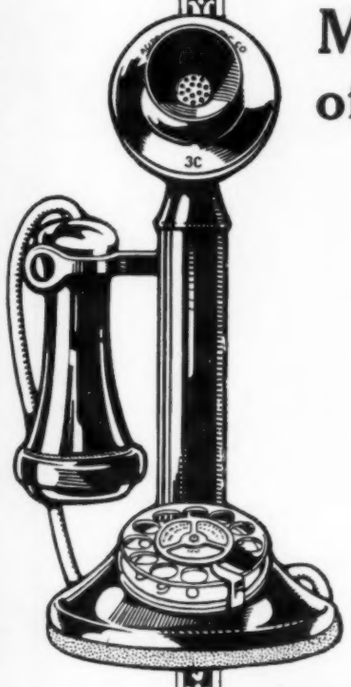
TELEPHONE ENGINEER

VOLUME 28 AUGUST, 1924 NUMBER 8



Modernizing the Telephone System of America's Engineering Wonder

THE telephone system of the Panama Canal Zone is to be completely converted to Strowger Automatic operation. Orders have been placed with Automatic Electric Company for 3000 lines of equipment to be distributed among the four central offices at Gatun and Cristobal at the North end of the Canal, and at Balboa and Pedro Miguel at the South end.

The new installation will provide for full automatic operation of both local and long distance calls within the Canal Zone, no intercepting operators (except for P. B. X. service) being required.

The climatic conditions at the Canal Zone are similar to those in Cuba, the Philippines and Hawaii, where Strowger Automatic equipment has been used for many years with the greatest success. In the Canal Zone itself, Strowger Automatic equipment has already proved its fitness, a 50 line Community Automatic Exchange having been in operation at Gamboa, C. Z., for five years.

The Panama Canal authorities have always been foremost in the adoption of any development that means the saving of time, the reduction of errors or greater certainty in operation and administration. It is therefore fitting that the latest step in the development of this great enterprise should be the conversion of its telephone exchanges to the system that is rapidly being adopted as the modern standard in every part of the world.

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Factory and General Offices: CHICAGO, ILLINOIS

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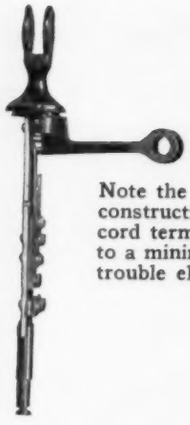
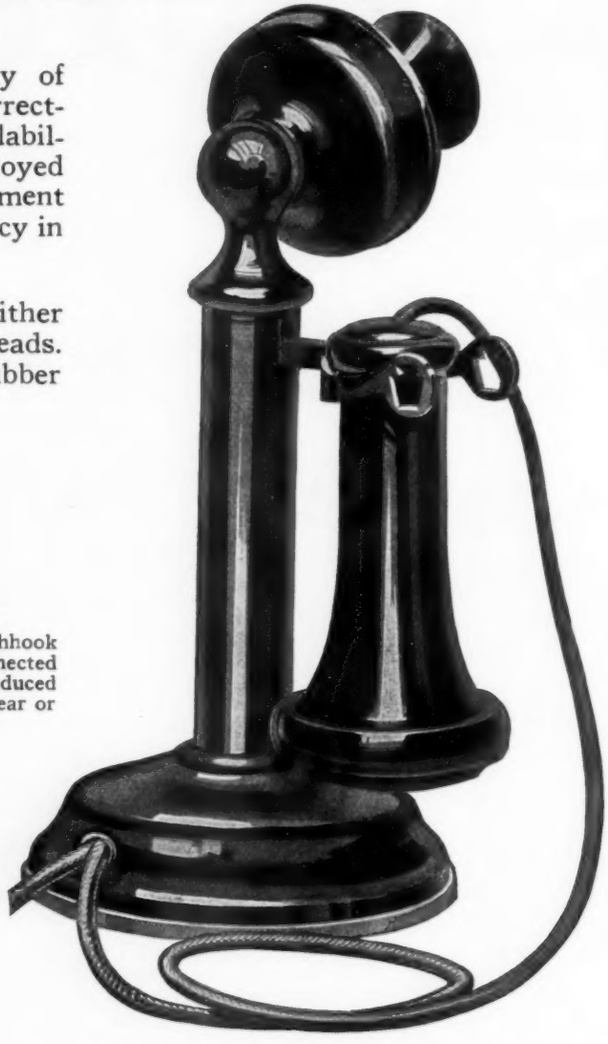
Stands are supplied with either solid or adjustable transmitter heads. Base is equipped with Burns Rubber Cushion.



IN THE STEM

Note the simplicity of the Switchhook construction and the direct connected cord terminals. Equipment is reduced to a minimum and all possible wear or trouble eliminated.



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Burns Loud Speakers and our Radio Head Telephones Have Proven exceptionally popular—They are built by telephone experts.

A stock of our standard equipment is carried in stock by a distributor in your territory

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CHICAGO, U. S. A.

FOR OVER 30 YEARS MAKER OF GOOD TELEPHONES

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NEW UNIT FOR TRANSMISSION MEASUREMENT

Adoption of a new unit by the Bell System for the measurement of transmission is of more than passing interest. For many years, it has been recognized that the units in use were not entirely satisfactory and there has been no world-wide adoption of any one of them, as has been the case with other electrical units—the volt, ampere, watt and others.

In America, for many years, the unit was the "mile of standard cable," by which comparisons were made with existing lines and with apparatus. This unit required two observers who made comparisons by taking tests, alternately, over the standard cable and the line to be tested. In the absence of a better method it served, but it was very inconvenient and was subject to error, due to the personal element, as well as to the instability of the telephone equipment used as the terminal apparatus. Later, the transmitting of the voice was superseded by the use of an 800-cycle current and measuring instruments were developed to measure the output. This unit came to be known as the "800-cycle mile."

In England, the mile of standard cable also is used as a unit of measurement but, on account of a difference in the terminal apparatus specified, it is not quite the same as the American unit. This unit was proposed for international use at the conference on Long Distance Telephony at Paris last year. On the Continent, most of the telephone administrations have adopted the so-called Beta-1 standard, which is derived from the attenuation constant of the line. While this unit has a rational basis as far as the line is concerned, it is difficult to get a conception of its application to a piece of equipment or a circuit containing equipment.

It also has disadvantages in that its value is not a convenient one and that the number of units that represent the limiting value for transmission is different for different types of line.

It is not an easy matter to adopt an entirely satisfactory standard for transmission. The new unit probably approaches the ideal as closely as it is possible to do at the present time. It has a rational basis, being a definite ratio of power at two points on the circuit, whether it be a line of a circuit containing equipment. It is distortionless in itself and can be applied to all types of circuit, so that when tests are made at various frequencies, the results can be expressed in terms of a unit which is independent of frequency.

Very little readjustment is required in the ideas of those who have been accustomed to the mile-of-standard-cable unit as the value of the new unit lies between the value of mile of standard cable at 800 cycles and a mile of standard cable at 1000 cycles.

Since the new unit has been adopted by the Bell system, it would seem that the Independent side of the industry should immediately adopt it, and it is to be hoped that foreign practice may be adjusted shortly, so that a single unit may be used, universally.

THEORY VS. PRACTICE

Not infrequently in discussions of technical questions, the remark is made, "That is all right in theory but it won't work in practice." Often it is reserved for the final blow that is supposed to put an end to all expression of counter-opinion. In other occasions it is merely an imperfect statement of the idea that, for the case in hand, two solutions arrived at by different methods are not in complete agreement.

By "theory" is usually meant a group of general laws, either proved or assumed, and a "theoretical" solution is a solution obtained by the application of general laws to a particular case. By "practice" is usually meant a solution obtained from a consideration of what has been done in the past, checked by the experience and judgment of some individual, without reference to the underlying laws. Actually, the two are not mutually exclusive. Every solution contains something of both theory and practice. Most "practical" men know a great deal of the underlying principles used in their work, although they may not know how to express them. The railway track laborer may never have heard of the principle of the lever, but he knows how to set his crow-bar and block to get the maximum effect.

A professor of logic in attacking the statement that something is right in theory but will not work in practice, might show that the statement falls of its own weight because, if it will not work in practice, it is not right in theory. It is not the purpose here, however, to enter into a problem

of dialectics, but to point out that theory and practice must agree if the one best solution is to be found. Not all theoretical solutions are correct. Their correctness depends upon the correctness of the underlying theories and upon the manner in which the principles have been applied in the particular case. Likewise, not all practical solutions are not right. The mere fact that it will work does not prove that it is the best solution.

When two solutions, one theoretical and one practical, do not check up, it is more reasonable to assume that neither is entirely correct. Perhaps there are some factors that have not been considered in the theoretical solution or, if they have been considered, have not been given sufficient weight. Lack of attention to some of the fundamental laws may have given a practical solution that will not get the maximum result with a minimum expenditure of time, effort or material.

Instead of condemning one solution, forthwith, when it is found that they do not check, the proper procedure is to attempt to harmonize the two. If this procedure is followed without bias or prejudice the result should be the finding of the one best solution which is the aim in every engineering problem.

A VACATION PHILOSOPHY.

Common thought has it that a vacation is a time of rest for body and mind; of relaxation, of freedom from the manifold cares of ordinary living, of emancipation from the routine of the daily task, which, however interesting, becomes wearying if too long continued. But a vacation may also be of benefit to the spirit. With something of a shock the vacationer learns that his absence has caused no serious disarrangement of the world, or of his small corner of it. Upon his consciousness dawns the salutary lesson that no one is indispensable.

WHY NOT A CODE OF STANDARD SYMBOLS?

The National associations of electrical engineers, architects, electrical contractors and dealers have agreed upon a code of symbols for electrical equipment of buildings which is now published as a "Tentative American Standard" by the American Engineering Standards Committee. This code will be used on architects' drawings of buildings to indicate the various electrical circuits and appliances. It also will be used on engineers' and contractors' layouts for building jobs. Soon, everyone who has anything to do with this class of work—and that includes telephone men, for there are symbols representing telephones and switchboards of various classes, as well as wiring and terminal cabinets—will be using the same symbols and each will be able to read a drawing made by anyone else without having to refer continually to a special code of symbols.

Adoption of this code leads to thought of the advantage there would be if a similar universal code of standard symbols were used by all telephone companies for drawings of pole and cable layouts. Perhaps, it might be adopted, also, for switchboard and instrument circuit drawings, although the problem here is somewhat different. The Bell system, no doubt, has such a code of symbols, but there is none in the Independent field. The Independent field now has the beginnings, at least, of an organization to handle such matters, and if a few telephone companies would write to the Association expressing their need and desire to use such a code of symbols, the proper Association committee, undoubtedly, would begin to function, and a code speedily would be evolved.

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CITIES CANNOT OUTGROW THEIR PUBLIC UTILITIES.

In a booklet, "The New Fort Wayne," which was written by E. L. Gaines of the Home Telephone and Telegraph Co., and published by the Chamber of Commerce of that city, we find the following statement:

"The physical growth of a city is made possible by the prior expansion of its public utility services. No community can outbuild its public utilities to any great extent. As soon as building operations exceed the point where public utility services can be supplied, growth must cease until the utilities catch up. Ordinarily growth will not take place until public utility services are available. The utility must spend money in advance to provide facilities to make service available in large quantities in every part of the city where it may be needed. The modern home is modern because of water, gas, electricity, telephone and postal service and accessibility to street car service."

The facts set forth are evident to anyone who will give them but a moment's thought, yet how many times do we find ambitious cities where chambers of commerce are scouring the country in an effort to find new industries to locate in them and at the same time are strangling the local public utilities by opposing their efforts to obtain fair rates.

Improving the Magneto Set

Being a Suggestion for Reducing the Number of Parts

By J. M. WALSHE

The magneto telephone set in its present form consists of a number of instruments assembled together in a case. There are usually the following instruments: ringer, generator, receiver, induction coil, switch hook, transmitter and battery. Some sets have a grounding key or other additional parts. A magneto telephone set costs a large sum compared to a central battery set because of the more numerous instruments of which it is composed.

In view of this, the possibility of reducing the number of instruments in a magneto telephone set is worth some consideration.

Besides the consideration of economy there is another consideration, namely, efficiency.

Some suggestions by which the number of instruments in a magneto telephone set may be reduced are made in the belief that they form a practical solution of the subject.

Any telephone man knows what strong impulses are given to the magneto armature if central rings when the winding is across the line.

Why not arrange that the winding is always across the line and use these strong impulses as a ringer, that is, combine the generator and ringer?

Before proceeding further let us consider if this could not be done. Two possible reasons suggest themselves. First, it might cut down the speech. This would not be a serious loss if there was any, for the impedance of a generator armature to alternate current at a frequency of 800 cycles is probably not much less than that of a 1000 ohm ringer.

Secondly, it might reduce the current through the clearing out drops so as to impair its operation. Both these difficulties could be overcome by winding the armature to a higher resistance; the use of enameled wire and a smaller size would take care of this.

When the H armature of a generator is at rest the legs of the H are occupying the hollows of the pole pieces and at a dead center as regards the force exerted by an incoming current. This has to be altered. Probably the simplest way is to oppose this position of rest by a coil spring so that the position of rest is at right angles to that formerly occupied. The coil spring would act on a pin projecting from the small gear wheel at right angles to the radius and near the rim.

Other ways of accomplishing this end could doubtless be used and might be more efficient, but a spring so placed would only oppose the pull due to the magnetism of the pole pieces and should tend to produce a more even-running armature.

Editor's Note: Some centuries ago a courageous individual dared suggest the revolutionary idea that the earth had the shape of an apple rather than that of a plate. The wiseacres and the bigwigs promptly took up arms in defense of traditional ideas and the proponent of the new idea was tagged with a variety of labels ranging all the way from mildly insane to a menace to society. But, in spite of this, an able navigator with three small ships sailed westward to find the Indies and discovered a New World where grew up the telephone and all manners of wonderful things. The author of this article is fearful that his suggestion will be considered "too radical or even preposterous." But radical ideas are sometimes needed to jar us out of the complacent way of doing things as we have always done them. The magneto telephone will certainly stand simplification if it is possible to simplify it. The present suggestion may point the way. It has one advantage over many radical suggestions; it will work. How do we know? We tried it.

The armature now moves in response to the applied ringing current, but it is not possible to attach a ringer hammer to the armature so another method must be used. This is nothing less than coupling a suitable piece of soft iron to the armature magnetically. Practically it is accomplished as follows:

The end plate carrying the spring assembly is removed and on the spindle is first placed a washer of iron, then the special soft iron armature, which is made the shape of an ordinary ringer armature, one-eighth of an inch thick, half an inch wide and with rounded ends, the total length to be equal to the diameter of the generator armature lamination. The hole in the center of this should be carefully drilled so that it can rotate freely yet without any rock or play. The ringer hammer is screwed into a drilled and tapped hole in one of the rounded ends and is about the usual length for a ringer hammer.

The hammer projects downwards and the gongs are mounted beneath the shelf on which the generator rests. In some cases the hammer will have to be offset. There is no reason why the gongs should not be located in other positions, but this seems the most convenient for experimental purposes.

Having got the special armature in place another washer is put on the spindle and the end plate with spring assembly has to be held out about three-sixteenths of an inch by means of collars on the screw threads. Of course when specially manufactured, space will be allowed for the special armature.

The magnetic action is as follows: When the alternating current flows through the generator armature the segment shaped legs of the H become positive and negative alternately, as the special ringer armature is very close to them it becomes magnetized in turn and being free to move it is able to strike the gongs with its hammer. Stops can be installed on the end plates to control the movement of the hammer and take advantage of the flexibility of the hammer handle to prevent the hammer head resting against the gongs. The spring assembly will now be out of adjustment, but as it will not be required it may be removed, retaining only the collecting spring. This should give a good pressure on the end of the armature so that it will hold the armature from crowding the special ringer armature.

Latest Report Shows India's System Growing

Calcutta, India. — Assistant U. S. Trade Commissioner Donald Renshaw reports there were in existence in India on March 31, 1923, according to the Telegraph Department, 227 telephone exchanges, with 13,320 connections, owned and maintained by the Government, of which 140 exchanges with 1,468 connections were not operated by the department itself. In addition there were 345 independent exchange systems with 1,157 telephones. Licensed companies owned 12 exchanges with 25,590 connections The revenue of these systems for the fiscal year 1923 was 4,852,532 rupees, as compared with 4,169,004 rupees for the previous year. (The rupee is normally worth $0.48.) The increase in earnings noted above can be attributed partly to the expansion of the system and partly to increased rates. The estimated value of the telephone system on March 31, 1923, including trunks, was 19,100,000 rupees.

Telephone Pole Line Data

Importance of Good Guying Calls for Some Additional Information on That Subject—Factors Affecting Its Efficiency—Some Typical Guying Conditions Described—Special Guying Problems

By P. KERR HIGGINS

Foreword: The writer has just completed an extended trip through southern Missouri, Oklahoma, Texas and old Mexico and was surprised to see the interest that is being taken in these articles and to learn how many men were actually filing them for future reference. In at least twenty instances, the readers did not seem satisfied with the amount of data given on guying, on account of the importance of this subject, and so, in order to answer a number of these queries, the following additional data is submitted:

The writer was very much pleased, too, to note the very great improvement which has taken place in construction methods during the past ten or fifteen years. In looking over the telephone plants in Mexico, while that country is probably twenty years behind the United States in many ways, one could not help but notice the extensive use of steel and iron poles in the cities, as well as in the country. In the cities, steel poles and fixtures are very common and, in many cases in the country, steel cross arms are very much in use. Climatic conditions seem to be favorable to this class of construction. The writer was very much impressed with the fact that it seems only a question of time before there is a much larger use of steel poles in the U. S. A. In Mexico, many of the poles are set in concrete. The use of tenpin arms in Mexico is very scant, the bulk of them being either six or eight pins. I was informed by reliable authority there that some of these poles have been in use twenty years, and they look to be in very good shape—perhaps good for twenty years more. The bulk of the telephone equipment in Mexico is of foreign make and, while there were many refinements, the design of the equipment is very much like what the writer saw in Europe in 1914. While writer has not had much experience with steel poles in this country, it would be very interesting if some reliable data could be obtained thereon.—P. Kerr Higgins.

Importance of Good Guying

Nothing contributes more to the stability of a pole line than good guying. When weak corners give way, the pole line starts on the down grade as far as appearance is concerned and on the up grade as to maintenance expense. Trouble for the trouble man commences to pick up and continues until the pole line is straightened up again. A book might be written on the subject of building corners and guying but in a magazine article such as this we must be content to touch only the high points. The primary use of guys is to counteract the unbalanced tension of wires or cables and to counteract stresses in the pole itself caused by the pull of wires or cables at curves or corners.

The effect of an unbalanced side pull on a pole depends upon the weight or force applied and upon the distance above the earth at which the load is applied. It is figured by multiplying the height in feet by the load on pounds. If a load of 2000 pounds is applied at a point three feet from the top of a fifty-foot pole set seven feet in the ground, the product would be 80,000. This is the same as if a load of 80,000 pounds were applied one foot above the ground line. Of course, no pole could stand such a load as this if it were perfectly rigid. However, there is no such thing as a perfectly rigid pole, nor is the supporting earth rigid. Therefore, the result is that the pole would be pulled over and bent until the load is reduced to a much smaller value. Corner poles usually give way from one or more of three causes: The pole sinks in the ground or buckles; the guy wires slips on the pole or crushes the sap wood or the anchor gives in the earth in which it is set. Prevent these causes and a corner pole will stay where it is placed until natural decay makes its removal necessary.

Guys may be classified in several ways: They may be classified as pole guys and cross-arm guys, depending upon whether they are supposed to hold poles or only cross arms in alignment; they may be classified as head guys and side guys, depending upon whether they are arranged to support a load in line with the pole line or transverse to the pole line; they may be classified as anchor guys, tree guys, rock guys, etc., depending upon the manner in which they are fastened. Reference will be made to various types in the course of this article.

Some Factors Affecting Efficiency of Guying

The efficiency of all guying depends very largely upon the relative position of the guy wire or stub to that of the pole.

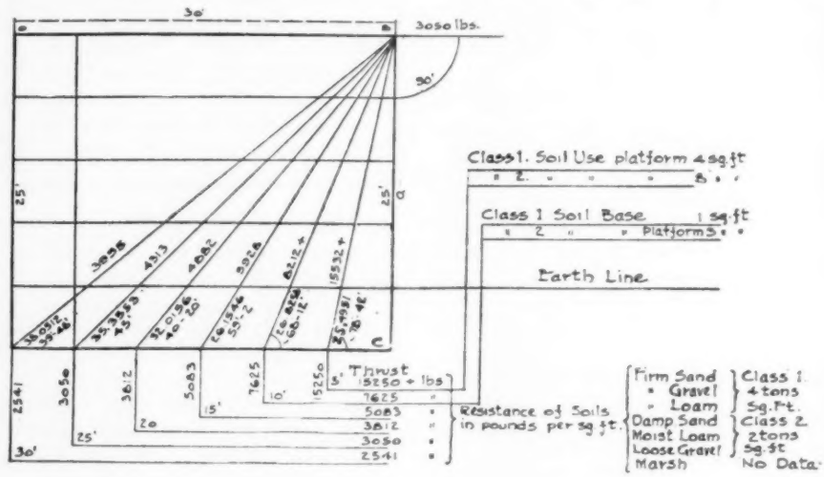

Fig. 1

As a general rule, the acute angle should be halved for bracing and the obtuse angle halved for guying. This was shown graphically in Fig. 3 on page 18 of the May number of Telephone Engineer. It may be laid down as a rule of guying that the guy against every pull must be placed as nearly as possible to the point of application of the load; that the guy must be of sufficient strength and must be set in such a way that it will take up the load to which it is opposed. The location of the guy wire on the pole is very important and depends upon the location of

the cross arms, cable or other fixtures. If it is attached too far above or too far below the point of application of the load, the bending strain in the pole is increased. In order to avoid buckling of a pole which carries several cross arms, some engineers recommend a branch or Y guy to a lower point on the pole in addition to the top guy.

The location of the guy at the ground is also extremely important. As a general rule, the farther back from the pole the anchor can be placed, the better. The nearer the anchor is to the bottom of the pole, the greater is the strain on the anchor and the greater is the thrust of the bottom of the pole on the earth. This is shown graphically in Fig. 1. While the figure is self-explanatory, attention may be called to the fact that the strain in the guy wire is 15,532 pounds and the thrust on the earth is 15,250 pounds when the guy is five feet from the base of the pole. If the anchor is 30 feet from the base of the pole the strain in the guy is reduced to 3955 pounds and the thrust of the bottom of the pole is reduced to 2541 pounds. These figures are for the assumed conditions of a vertical pole with a side load of 3050 pounds applied at a point 25 feet above the surface of the earth. Incidentally, the figure gives some information as to the resistance of soils in pounds per square feet for different classes of soil.

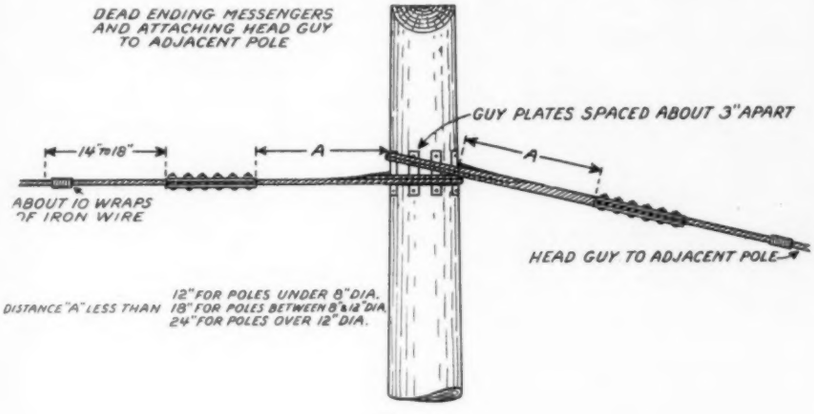
DEAD ENDING MESSENGERS AND ATTACHING HEAD GUY TO ADJACENT POLE
GUY PLATES SPACED ABOUT 3" APART
14" TO 18"
A
A
ABOUT 10 WRAPS OF IRON WIRE
HEAD GUY TO ADJACENT POLE
DISTANCE "A" LESS THAN 12" FOR POLES UNDER 8" DIA.
18" FOR POLES BETWEEN 8 & 12" DIA.
24" FOR POLES OVER 12" DIA.

Fig. 2

Guying Materials Most Commonly Used

Some of the more common materials used for guys are described in the following paragraphs:

GUY STRAND — All guy strand should be of galvanized steel varying in size according to the load to be carried. The most popular size is 5/16 in. Sizes smaller than ¼ in. should not be used. Strand is made up of seven wires.

MECHANICAL PROPERTIES — The wire should be capable of four per cent elongation without breaking. When clamped in vises six inches apart the wire should stand fifteen twists without breaking. When tested by direct application of weight, the wire shall not break when subjected to a load of at least four and three-tenths times its weight in pounds per mile.

Finish—The wire should be cylindrical and free from scales, inequalities, flaws, splints, sand and other imperfections.

Galvanizing—The wire shall be well galvanized and capable of standing the following tests: The sample shall be immersed in a saturated solution of copper sulphate for one minute and then wiped dry. This process shall be repeated three times. If, after the fourth immersion, there shall be a copper deposit on the sample or if the galvanizing shall have been removed, the lot from which the sample was taken shall be rejected.

Lay of Strand—The seven strands shall be laid out with a right hand lay not exceeding three and one-half inches in length.

GUY RODS—Guy rods should be six or eight feet long, of galvanized rod. 5/8 in. is a common size.

THIMBLES — Thimbles should be made of 3/32 in. galvanized iron and should be not less than 3 in. long.

GUY CLAMPS — All guy clamps should be standard, three-bolt clamps, made to hold the size of strand used. The longitudinal curve of the grooves should be the same in both parts of the clamp. They should be made of high carbon steel, thoroughly galvanized and should have a breaking strength of not less than eighty thousand pounds per square inch. They should be smooth and free from imperfections. Threads of the bolts should be recut after galvanizing.

Methods of Fastening Guys

The general method of fastening guys to poles is shown in Fig. 2. The strand is wrapped twice around the pole or guy stub. If 6000 pound strand is used, the strain plates may be omitted. When 10,000 pound strand is used, there should be two clamps and on larger sizes three clamps are used. The end of the strand should be bound down to prevent accidents.

The height of the guy should conform to local requirements and should never be less than eighteen feet over driveways and eight feet over sidewalks. Carelessness in placing guys often entails considerable annoyance and expense, hence great care should be taken to avoid the possibility of causing an obstruction or injuring persons or animals. In exposed positions, the guys should be protected by suitable guards, either wooden boxes or a piece of iron pipe being slipped over the strand for this purpose.

Storm Guying for Heavy Loads

On straight lines carrying more than one cross arm, poles should be storm guyed at convenient intervals. Head guys are run from the top of a pole to the butt of the next pole in the line on each side. Where possible the line should also be side guyed at the same pole. The purpose of this kind of guying is to provide additional strength or to provide guying against unusual loads that may be thrown on the line during severe storms.

Guying of Short or Light Pole Lines

Where a short lead of poles leaves the main lead, many construction men are inclined to let this lead take care of itself without any guying. This is a great mistake as the lead looks bad and is the frequent cause of high maintenance expense and much annoyance. It is only a question of time before the end poles bend, causing unnecessary slack and crossed wires. The writer has found it to be good practice in such cases to use a light patent anchor of some approved type. In guying light leads, No. 6 iron wire may sometimes be used to advantage in place of strand.

Use of Patent Anchors

If good judgment is used and care is taken in placing them, patent anchors prove quite satisfactory and are cheaper than "dead men." They are usually of three kinds: the type which screws into the ground without digging; the kind which is driven into the ground with a sledge hammer and which is expanded either by turning or by pulling back from six to eighteen inches; and the types, whose name is legion, that are put into a hole by means of a post hole digger and which have various mechanical contrivances for holding them in place after the earth is filled in. The most popular types seem to be the ones which screw into the ground without digging and the latest type of anchor that is inserted into an augur hole and expanded by means of a special tool which forces its parts into the solid earth on the sides of the hole.

Special Guying Problems

Tree guys may be used in special cases. They should never be fastened to a limb as there is too much vibration. Hard wood cleats should be placed around the tree under the guy. It is sometimes necessary to drive a large spike or a pole step into the tree to keep the guy from slipping. If its use is practicable, the rock anchor in which the guy is anchored in rock instead of to a tree or an ordinary anchor is almost ideal.

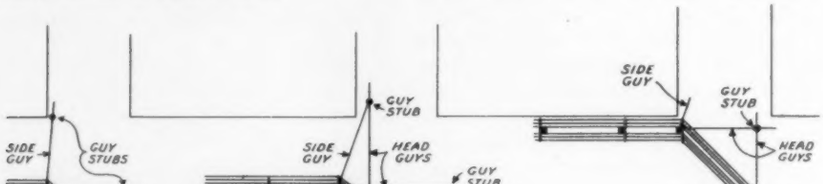

Fig. 3

Where the regulation guy can not be erected, a special guy may be arranged by fastening one end to the foot of the pole and the other end to the top with an outrigger in the center so arranged on the side opposite the pull to keep the guy about two feet from the pole. Where the strain is very heavy, a pole of iron or structural steel may be used. This may be made of two beams bolted securely together.

Cross Arm Guys

Where open wires terminate on a cross arm so that the pins on only one side of the arm are used, the unbalanced load tends to twist the cross arm out of place. This may be cared for by a cross arm guy. Usually a single iron or steel wire about No. 9 or No. 10 BWG is attached to the cross arm, close to the outer pin, on the side opposite that on which the pins are occupied, and is carried to the next pole where it is drawn taut and dead-ended around the pole just below the corresponding gain.

Some Typical Guying Conditions

The location of guys is better shown graphically than described in words. Therefore, several figures are shown to illustrate some of the typical conditions found in practice. In Fig. 3 are shown some of the conditions to be met when a right-angled turn is made on two poles. It will be noted that the distance from the corner pole to the next pole is less than the normal distance in the line and that the cross arm on the second pole is faced toward the corner. On heavy lines the second pole is frequently head-guyed to the butt of the corner pole. Fig. 4 illustrates the method of guying the poles set on a curve. Fig. 5 shows the method of making a road crossing. Here again, the span nearest the corner is short and the arms on the second poles are faced toward the corners. The wires should cross the road at an angle of approximately 45 degrees and both head and side guys are used. On heavy lines, the second pole also is, frequently, head-guyed to the butt of the corner pole. If conditions are such that side guying is impossible, the poles at the crossing should be supported below the surface of the ground by a log so placed that the butt of the pole will bear against it when the wires are pulled up.

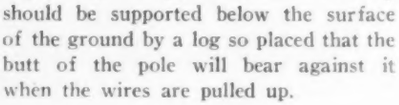

Fig. 4

Summary Regarding Guying and Anchoring

The suggestions that have been given in this and in previous articles as to the proper way of installing anchors and guys may be summarized in the following list:

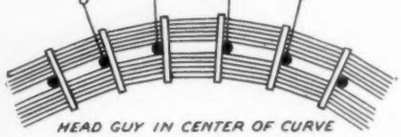

Fig. 5

1. The end of the guy wire should be fastened with two complete wraps at a point on the pole as near as possible the point where the load is applied.

2. All clamp bolts should be screwed down tightly.

3. Use a thimble where the guy strand passes through the eye of the guy rod.

4. When guying a heavy lead, use two guys separated on the pole or use a Y or branch guy.

5. When two guys are placed on the same pole, see that they are pulled evenly so that each holds its portion of the load.

6. The use of guy strand smaller than 5/8 in. is not recommended.

7. The use of strain plates or shims is optional on strand smaller than 10,000 pound. For this size, and larger, they are necessary.

8. Head guys are placed under the messenger and side guys are placed over the messenger when both guys and messenger are placed on the same strain plates.

9. Guys as a rule should make an angle of 45 degrees, that is the distance from the butt of the pole to the eye of the anchor rod should be the same as the distance from the ground to the point where the guy is attached to the pole.

10. A corner with more than 25 feet pull should be divided and two poles used.

11. Spans at corner poles should not be more than two-thirds the length of regular line spans.

12. Patent anchors may be used to advantage where the pull is not too great.

13. For strains of 6000 pounds and over, use log anchors.

14. Anchor rods should be of a sufficient size to carry a load considerable in excess of present requirements.

15. Be sure to use large washers or plates on all anchor logs and see that they bear evenly against the wood. The hole for the rod should be bored large enough to allow the rod to be put through without driving.

16. Use head and side guys at poles on corners and on street crossings. If side guys must be omitted, head guy second pole from corner to butt of corner pole.

17. Messenger may be carried one span beyond the terminal pole and there dead-ended and guyed.

18. Terminal poles between cable and heavy open wire leads should be set in line with the lead and head-guyed both ways.

19. Messenger should clear the rail by 25 feet at railroad crossings. As an added precaution it is well to guy on both sides of the crossing.

20. Messenger should be pulled tight after the anchors are placed and before the cable is pulled in.

21. Messenger should usually be strung on the street or alley side of the pole.

22. At ends of guys and at messenger dead-ends the loose end of the strand should be bound down firmly to prevent possible accident.

Bell St. Louis Home Classic

New Type 306-ft. Skyscraper to Cost $8,000,000

St. Louis, Mo.—A sky-scraper, which will house the Southwestern Bell Telephone Company's administration offices as well as the machine-switching units for downtown St. Louis, will be the loftiest peak in the city's jagged range of buildings. It will, to change the metaphor, strike the top note in the local architectural scale—a beautiful, flute-like note, vividly recalling that significant phrase which describes architecture as "frozen music."

The new headquarters building will be constructed along lines hitherto unknown in St. Louis, or, for that matter, in the West. It will tower 306 feet heavenward, its "set-back" design allowing plenty of light and air to penetrate into the streets below. It will cost, when completed, practically $8,000,000.

The designers of the structure are Mauran, Russell and Crowell, architects, with I. R. Timlin, associate architect, under the direction of W. O. Pennell, chief engineer of the Southwestern company.

The tapering sky-scraper will be thoroughly commercial in character, containing twenty-five floors of offices, with a total floor space, above the basement, of 460,133 square feet. The complete structure will cover the entire city block bounded by Pine, Chestnut, Tenth and Eleventh streets. As the headquarters of the Southwestern System, it will bear dignified witness to the growth and importance of a great public service.

The new building will be erected in two units. The initial structure, fronting on Pine street and extending back approximately 143 feet on Tenth and Eleventh streets toward Chestnut, is scheduled to be completed within two years. This will call for immediate wrecking of the old buildings that now occupy about two-thirds of the block.

The Company's announcement of the plans for a new headquarters building comes at a time when the final unification of the two telephone systems in St. Louis—the Bell and the Kinloch—is in sight. But even before this important merger, which adds 35,000 stations to the Bell, became a factor in planning for future development, there was felt the need for larger quarters—not only to serve St. Louis, but to house the growing number of general office employees, engineers and others who are necessary in administering a business that operates in five states. These general offices are at present provided with space in three buildings, several blocks away from each other. A large amount of space is rented in the Boatmen's Bank Building, a considerable portion of the Planter's Building is occupied, and the "Central" Building, acquired from the Kinloch Company, provides a comparatively small amount of office room.

As for the local operating quarters, the downtown portion of St. Louis is now served by three central offices—Main, Olive and Central. It was readily apparent to those studying the future demands for telephone service in St. Louis that these offices would soon be extended as far as is economical. The logical answer was a new central office in the downtown area to handle the growth. An extended study of the situation resulted in the decision that the new central office should be a machine-switching office. And since there is no space in any of the present buildings for a machine-switching office, it became necessary to provide a new building to house the new type of equipment.

Architect's Drawing of New Southwestern Bell Building

Combining the need for a unified general office building with the need for quarters to house the machine-switching equipment, the men studying the problems decided upon the project of erecting a large administration building to take care of both. This building will be planned so that it will house enough machine-switching plant to care for the downtown area for many years to come, and it will also be arranged so that the long-distance board can be moved from the Bomont office to the new structure, in case this becomes necessary.

This type of building cuts off but little light from the surrounding buildings.

The exterior facades of the building will be faced with light-colored vitrous brick of a warm, gray color and will be trimmed with lighter colored terra cotta The piers of the building between windows will be heavily ribbed, which, with the play of the light, will produce strong vertical shadows. There will not be a great amount of ornamentation, the effect of beauty and strength being gained from the graceful proportions of the masses instead of from the details.

Half of the first floor of the building will be occupied by the Company's commercial office, and the ceiling height will be about twenty-two feet to provide space for the mezzanine or balcony in the commercial office.

The second floor will be occupied by the machine-switching equipment. For a few years, the third, fourth, fifth and sixth floors will be rented to outside tenants, the balance of the building being occupied by the Telephone Company's offices. The Company is now occupying about 110,000 net square feet in three different buildings, and it will occupy about 130,000 square feet initially in the new structure. The offices of the executives will be on the floors near the top of the building, while one wing of the upper stories will be taken up by a large assembly hall with a seating capacity of about 500.

Ask Commission O. K. on Illinois $1,000,000 Combine

Springfield, Ill.—The petition of the Macoupin County Telephone company of Carlinville, the Virden Home Telephone company of Virden, the Girard Telephone company of Girard, and the Gillespie Home Telephone company of Gilespie, for authority to consolidate as the Illinois Central Telephone company, has been filed. The petition also asks for authority for the consolidated company to issue $101,000 of common stock, $140,000 of preferred stcok, and $252,800 of first and refunding mortgage gold bonds as part of an issue of $1,000,000 of the bonds. The capital stock is to be apportioned among the four companies as follows: Macoupin County Telephone company, $55,000 common and $60,000 preferred stock; Virden Home Telephone company, $20,000 of common and $25,000 of preferred stock; Girard Telephone company, $5,000 of common and $25,000 of preferred stock; Gillespie Home Telephone company, $21,000 of common and $30,000 preferred stock.

Kansas has 50,000 more telephones than the whole of South America.

There are 700,000 telephones in Chicago. It took twenty years for the first 100,000, but only two years for the last 100,000.

The New Transmission Unit

Description of the New Distortionless Transmission Unit Adopted to Replace the Familiar "Mile of Standard Cable," to Which It Is Approximately Equal in Volume Ratio

By W. H. MARTIN

(*Member of A. I. E. E., Dept. of Dev. & Res., A. T. & T. Co., New York, N.Y.*)

The "mile of standard cable" has been used in telephone engineering in this country for over twenty years, and during that time has been adopted in other countries as the unit for expressing the transmission efficiency of telephone circuits and apparatus. In the present state of the telephone art, this unit has been found, however, to be not entirely suitable and it has recently been replaced in the Bell System by another unit which for the present, at least, has been called simply the "transmission unit." Before considering the reasons for such a fundamental change and the relative merits of the two units, it may be well to review briefly the general method of determining the efficiency of such circuits and the apparatus associated with them.

The function of a telephone circuit is to reproduce at one terminal the speech sounds which are impressed upon it at the other terminal. The input and output of the circuit are in the form of sound and its efficiency as a transmission system may be expressed as the ratio of the sound power output to the sound power input. For commercial circuits, this ratio may be of the order of 0.01 to 0.001.

In the operation of the system, the sound power input is converted by the transmitter into electrical power, which is transmitted over the line to the receiver and there reconverted into sound power. The effect of inserting a section of line or piece of apparatus or of making any change in the circuit can be determined in terms of the variation which it produces in the ratio of the sound power output to the sound power input, or, if this latter is kept constant, in terms of the ratio of sound power output after the change to that obtained before the change was made. It should be noted particularly that the change in the output power of the system is the real measure of the effect of any part of the circuit on the efficiency of the system and that the ratio of the power leaving any part to that entering it is not necessarily the measure of this effect. For example, a pure reactance placed in series between the transmitter and the line may change the power delivered to the line by the transmitter and hence the output of the receiver, the magnitude and direction of the change being determined by the impedance relations at the point of insertion. The ratio of the power leaving the reactance to that entering it is, of course, unity, as no power is dissipated in a pure reactance. In other words, the transmission efficiency of any part of a circuit cannot be considered solely from the standpoint of the ratio of output to input power for that part, or the power dissipated in that part, but must be defined in terms of its effect on the ratio of output to input power for the whole system.

By determining the effect of separately inserting the many pieces of apparatus that may form parts of typical telephone circuits, an index can be established for each of these parts of its effect on the efficiency of the circuit for the conditions of which the circuit tested is typical. Similarly, the power dissipated in unit lengths of the various types of line can be determined by noting the change in power output of the receiver caused by increasing any line by a unit length. Such indices of the transmission efficiencies of the various parts of a circuit obviously have many applications in designing and engineering telephone circuits. These indices could be taken as the ratios expressing the change in the output power of the system. This, however, has certain disadvantages. For example, the combined effect of a number of parts would then be expressed as a product of a number of ratios. Likewise, for the case of a number of parts n of the same type in series, such as a line n miles in length, the effect would be expressed as the ratio for one part or one mile of the line, raised to the nth power. In many cases, these ratios and the powers to which they would need to be raised would be such as to make their handling cumbersome. If, however, these indices are expressed in terms of a logarithmic function of a ratio selected as a unit, the sum of any number of such indices for the parts of a circuit is the corresponding index for the power ratio giving the effect of the combination of these parts.

The "mile of standard cable" is such a logarithmic function of a power ratio. The new unit also meets this important requirement.

Definition of the Transmission Unit.

The "transmission unit" (abbreviated T U) has been chosen so that two amounts of power differ by one transmission unit when they are in the ratio of $10^{.1}$ and any two amounts of power differ by N units when they are in the ratio of $10^{N(.1)}$. The number of transmission units corresponding to the ratio of any two powers P_1 and P_2, is then the common logarithm (logarithm to the base 10) of the ratio P_1/P_2, divided by 0.1. This may be written $N = 10 \log_{10} P_1/P_2$. Since N is a logarithmic function of the power ratio, any two numbers of units, N_1 and N_2, corresponding respectively to two ratios, P_a/P_b and P_c/P_d, may be added and the result $N_1 + N_2$, will correspond to the product of the ratios, $P_a/P_b \times P_c/P_d$.

The reasons for the selection of this unit and the method of applying it, can probably be best brought out by a consideration of the practice which has been followed in determining and expressing the efficiencies of telephone circuit and apparatus in terms of "miles of standard cable."

Standard Reference Circuit.

Fig. 1 shows what has been designated the "standard reference circuit." It consists of two common battery

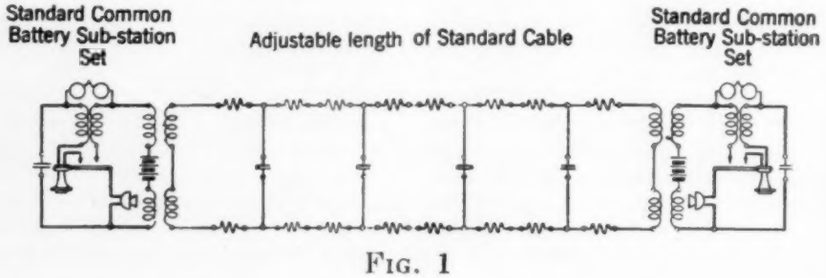

FIG. 1

Paper presented at the Annual Convention of the A. I. E. E., Chicago, June 25, 1924.

telephone sets of the type standard in the Bell System at the time this circuit was adopted, connected through repeating coils or transformers to a variable length of "standard cable." This cable is an artificial line having a resistance of 88 ohms and a capacity of 0.054 microfarad per loop mile which is representative of the type of telephone cable then generally used in this country.

For a given loudness of speech sounds entering the transmitter at one end of the circuit, the loudness of the reproduced sounds given out by the receiver at the other end can be varied by changing the amount of standard cable in the circuit. Also, the amount of cable in the circuit can be used to express the ratio of the power of the reproduced sounds to that of the impressed sounds. Due to the dissipation of electrical power in the cable, this ratio and consequently the loudness of the reproduced sounds become less as the amount of cable is increased and greater as the length of cable is decreased.

This circuit then became the measuring or reference system for engineering the telephone plant and the "mile of standard cable" became the unit in which the measurements were expressed. This circuit was used to set the service standards in designing and laying out the telephone plant. Thus, the reproduction obtained over this circuit with a length of cable of about twenty miles was found suitable and practicable for local exchange, that is, intra-city service, and that corresponding to about thirty miles for toll or intercity service.

Any telephone circuit was rated by its comparison with the standard circuit. This comparison was on the basis of a speaker talking alternately over the circuit to be measured and the standard circuit and a listener switching similarly at the receiving ends, the amount of cable in the standard circuit being adjusted until the listener judged the volume of the sounds reproduced by the two systems to be equal. The number of miles of cable in the standard circuit was then used as the "transmission equivalent" of the circuit under test. The effect of any change in the circuit under test on the efficiency of that circuit could then be measured by determining the variation in the amount of standard cable required to make the sounds reproduced by the two systems again equal and the number of miles of standard cable required to compensate for this change was used as the index of this effect. In this way the relative efficiencies of two transmitters or receivers could be determined. Likewise, the power dissipation per unit length or the attenuation, of the trunk in the circuit under test could be equated to miles of standard cable. Since in each case, the standard cable is used to adjust the volume of the reproduced sound, "the mile of standard cable" corresponds to the ratio of two amounts of sound power, or as this change in sound power is produced by changing the power delivered to the telephone receiver, to a ratio of two amounts of electrical power.

If the addition of a mile of standard cable to a long trunk of the standard circuit causes the power reaching the end of the trunk to decrease by a ratio r, then the insertion of two miles will decrease the received power by a ratio of r_2 of that obtained before the two miles were inserted. A number of miles of cable, n, inserted will reduce the received power to a ratio r^n. Thus the power ratio corresponding to any given number of miles of cable is an exponential function of the ratio corresponding to one mile, the exponent being the length in miles. The length in miles is, therefore, a logarithmic function of the power ratio.

In an infinite length of uniform line having resistance, inductance, capacity and conductance of R, L, C and G per unit length, the attenuation a per unit length, of a current of frequency f flowing along the line can be shown to be equal to the real part of the expression

$$a + j\,b = \sqrt{(R + j^2\pi f L)\ (G + j^2\pi f C)}$$

For the standard cable line, since L and G are zero

$$a = \sqrt{\pi f R C}$$

and since R = 88 ohms and C = 0.054 microfarad per mile the current attenuation per mile of standard cable is

$$a = 0.00386 \sqrt{f}$$

If I_1' and I_2' are the currents, respectively at the beginning and end of a mile of line, then

$$I_1'/I_2' = e^a \text{ or } a = \log_e I_1'/I_2'$$

Similarly if I_1 and I_2 are the currents, at points 1 and 2, respectively, at the beginning and end of a section of L miles

$$I_1/I_2 = e^{La} \text{ and } L\,a = \log_e I_1/I_2$$

For this case, the effect of inserting the section of L miles into the line on the current at point 2, or at any point beyond 2, is that the currents at the point before and after the insertion are in the same ratio as I_1/I_2. Furthermore, since the impedance of the line looking toward the receiving end is the same at points 1 and 2 (and at any other points), then the ratio of the powers at the two points is equal to the square of the current ratio.

Thus the power attenuation is represented by

$$P_1/P_2 = (I_1/I_2)^2 = e^{2a}$$

Similarly for a line, terminated in a fixed impedance which may be different from the characteristic impedance of the line, the ratio of the powers received before and after a change in the length of the line is equal to the square of the ratio of the corresponding currents. On the basis of this relation, and because it is in general more convenient to measure or compute currents than powers, the current ratio has often been used in determining the equivalent of any piece of apparatus or line in terms of standard cable. It should be noted, however, that such a current ratio can be properly used as an index of the transmission efficiency of a part of a circuit only when it is equal to the square root of the ratio of the corresponding powers. Also, of course, the voltage ratio can be similarly used when it meets the same requirement.

Limitations in Use of Standard Cable Unit.

As has been shown above, the attenuation, either of current or power, corresponding to the mile of standard cable is directly proportional to the square root of the frequency of the current under consideration. This means that the standard cable mile corresponds not only to a certain volume change in the reproduced speech sounds, but also to a distortion change. For comparisons between the standard cable circuit and commercial circuits with talking tests and as long as most of the commercial circuits had distortion comparable to that of standard cable, this two-fold effect of standard cable was desirable. At present, however, many types of circuits are being used which have much less distortion than standard cable. Also, the use of voice testing has been largely given up in the plant and it is now the general practice to determine the efficiency of circuits and apparatus on the basis of measurements and computations for single-frequency currents, a correlation having been established between these latter results and those of voice tests. These factors have made it desirable to have a unit for expressing transmission efficiencies which is distortionless, that is, is not a function of frequency.

Qualifications of a New Unit

The consideration of a new unit for measuring transmission efficiency brought out the following desirable qualifications:

1. Logarithmic in Character. Some of the reasons for this have already been discussed. In addition, the application of such a unit in measurements of sound make a logarithmic unit desirable, since the sensation of loudness in the ear is a logarithmic function of the energy of the sound.

2. Distortionless. The advantages of a unit which is independent of frequency have been referred to above.

In expressing the efficiency of the transmission of the high frequencies involved in carrier and radio circuits, such a unit is particularly desirable.

3. Based on Power Ratio. This is desirable because the power ratio is the real measure of transmission efficiency. As pointed out above, the current ratio can be used only when it is equal to the square root of the power ratio. Having the unit based on a power ratio does not, of course, require that measurements or computations be made on a power basis.

In considering the conversions between sound and electrical energy, it is obviously advantageous to have a unit based directly on a power ratio.

4. Based on Some Simple Relation. This is desirable in connection with the matter of getting a unit which may be widely used and may find applications in several fields.

5. Approximately Equal in Effect on Volume to a "Mile of Standard Cable." One reason for this is the practical one of avoiding material changes in the conceptions which have been built up regarding the magnitude of such things as transmission service standards. Also, the sound power changes which can be detected by the ear are of the order of that corresponding to a mile of standard cable. In measuring telephone lines and apparatus with single-frequency currents, it has been found that an accuracy of about one-tenth of a mile can be obtained readily and is sufficient practically.

6. Convenient for Computations. This refers to the matter of changing from computed or measured current or power ratios to transmission units or vice versa.

Properties of the Transmission Unit

A consideration of the above qualifications and of the various units suggested led to the adoption of the power ratio of $10^{.1}$ as the most suitable ratio on which to base the unit of transmission efficiency. The transmission unit is logarithmic, distortionless, is based on a power ratio and its relation to that ratio is a simple one. Its effect on the transmission of telephonic power corresponding to speech sounds is about 6 per cent less than that of one mile of standard cable. Regarding its use in computations, it has the advantage that the number of units corresponding to any power ratio, or current ratio, can be determined from a table of common logarithms.

For a power ratio of 2, the logarithm is 0.301 and the corresponding number of units is, therefore, this logarithm multiplied by 10, which is 3.01 T U. For a power ratio of 0.5, the logarithm is $9.699 - 10 = 0.301$ and the number of units is -3.01 T U A power ratio of 2 represents a gain of 3.01 units, and a power ratio of 0.5 corresponds to a loss of 3.01 units. If the above ratios were for current, the logarithms would be multiplied by 20. Thus a current ratio of 2 corresponds to a gain of 6.02 units and a current ratio of 0.5 corresponds to a loss of 6.02 units.

It will be noted that the T U is based on the same ratio $10^{.1}$ as the series of preferred numbers which has been used in some European countries and has been proposed here as the basis for size standardization in manufactured articles.* In common with this series, the T U has the advantage that many of the whole numbers of units correspond approximately to easily remembered ratios, as shown in the following table:

APPROXIMATE POWER RATIO.

Transmission Units	For Losses Fractional	For Losses Decimal	For Gains Decimal
1	4/5	0.8	1.25
2	2/3	0.63	1.6
3	1/2	0.5	2.
4	2/5	0.4	2.5
5	1/3	0.32	3.2
6	1/4	0.25	4.
7	1/5	0.2	5.
8	1/6	0.16	6.
9	1/8	0.125	8.
10	1/10	0.1	10.
20	1/100	0.01	100.
30	1/1000	0.001	1000.

It will be seen that the ratio for a gain of a given number of T U is the reciprocal of the ratio for a loss of the same number of units. Also for an increase of 3 in the number of units, the loss ratio is approximately halved and the gain ratio doubled. If the approximate loss ratios corresponding to 1, 2 and 3 units are remembered, the others can be easily obtained.

From this consideration of the properties of the transmission unit, it is evident that there is much to commend its use in telephone transmission work. Furthermore, since its advantages are not peculiar to this work, such a unit may find applications in other fields. It is now being used in some of the work on sound.

New Telephone Transmission Reference System.

With the standardization of the distortionless unit of transmission it is desirable also to adopt for a transmission reference system a telephone circuit which will be distortionless from sound input to the transmitter to sound output from the receiver. This system will consist of three elements, a transmitter, a line and a receiver. Each will be designed to be practically distortionless and the operation of each will be capable of being defined in definite physical units so that it can be reproduced from these physical values. Thus the transmitter element will be specified in terms of the ratio, over the frequency range, of the electrical power output to the sound power input, this ratio being expressed in transmission units. The receiver element will be specified likewise in terms of the ratio of sound power output to electrical power input. The output impedance of the transmitter and the input impedance of the receiver elements will be 600 ohms resistance. The line will be distortionless with adjustments calibrated in transmission units and will have a characteristic impedance of 600 ohms resistance.

Such a reference system is now being constructed. The transmitter element consists of a condenser type transmitter and multi-stage vacuum tube amplifier. The receiver element consists of an amplifier and specially damped receiver. Each element is adjusted to give only negligible distortion over the frequency range.

It is proposed when this system is completed and adjusted that it will be adopted as the Transmission Reference System for telephone transmission work. Other secondary reference systems, employing commercial-type apparatus, will be calibrated in terms of the primary system and used for field or laboratory tests when such commercial type systems are needed.

*Size Standardization by Preferred Numbers, C. F. Hirshfeld and C. H. Berry, Mechanical Engineering, December, 1922.

Big Cable Job Done in Record Time

New York, N. Y.—A big job of cable work was completed in record time here when the New York Telephone Co. placed 38 reels of cable weighing over 104 tons in six hours and fifty minutes. This cable was drawn into the conduits in the western half of the new 14th street subway between Avenue D and 14th street, Manhattan and North 7th street in Brooklyn. A special spur railway track was laid on Montrose avenue, Brooklyn, and the seven flat cars on which the cable reels were loaded were transferred from the Long Island Railroad to the subway tracks. The work was done under the supervision of R. J. O'Donnell, supervisor of cable placing, with a gang of 26 telephone construction men and a large gang of subway employees.

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Commercial Survey Service

A Story Giving Actual Results of Commercial Surveys of Service That Not Only Improved Service But Increased Use of Lines and Made Friends for the Telephone Company

By L. E. FREEMAN*

I want to tell you some of the things we are trying to accomplish by Commercial Service Survey work and then tell you of some of the results that have already been indicated by surveys which have been completed.

First, we are trying to co-ordinate through one general point of contact, the entire knowledge, resources and effort of the telephone organization for the benefit of individual telephone users. It is our idea to teach the subscriber to co-ordinate, within his own organization, the knowledge, resources and effort of his entire organization in effective use of the telephone service as an economic instrumentality in administering and developing his business.

To gain effective and economic use of the telephone service, it is necessary to co-ordinate the knowledge and resources of both the subscribers and the telphone company's organizations.

Through this work we not only assist the subscriber's organization to function as a part of our own operating organization, but we are enabled to function as a part of his organization, creating a closer working co-operation.

This work is an important step in the intelligent development of sales by the way of the telephone, both local and toll.

Last but not least, Commercial Service Survey work is one of the most effective forms of public relations contact so far developed.

Few of the things done in this work are new. They have all been done at some time and some place with a few subscribers by some employees. The viewpoint, only, is new. Equipment and service faults are corrected and a definite impression is given to the subscriber that the company representative not only has the desire and ability to serve but can obtain immediate and effective action.

A service survey was recently made at one of the insurance offices. The switchboard was located in a strong light so that it was difficult for the attendant to distinguish a dark signal from a lighted signal. The noise of fifteen typewriters and one adding machine made clear transmission at the board difficult.

Broken receivers, frayed cords, scratchy transmission, bad wiring conditions, and old directories were found. Many of these minor troubles were not seriously interfering with the service, but clearing them, changing a badly worn instrument, refinishing and moving the switchboard gained the appreciation and co-operation of the office employees and management. Two terminals were not often used and not needed, two outside lines which were at an extra mileage rate were not carrying a load equal to the load of other stations. The two terminals were taken out and the two outside lines changed to one line with extension station effecting a saving to the subscriber. After the complete report was furnished to this subscriber, Mr. Watson received the following letter, which we would like to read:

"I want to thank you personally for the copies of the survey and recommendations with which you have supplied the office. We, indeed, appreciate the service which was rendered us in this capacity. Through this work we have come to feel a much keener appreciation of the troubles of the telephone company. Your representatives have given us a much more intelligent desire for co-operation than we have had before. A copy of your survey and recommendations has been forwarded to our home office at Hartford, as we know they will be interested in reading the same."

Grain Dealer's Survey

Recently a large grain dealer said he was not getting as much out of his toll service as he should and that the toll rates were too high. Mr. Grain Dealer was much opposed to the use of the station-to-station class of toll service and would not take advantage of this lower rate. A detailed study of his toll business showed that out of 252 toll calls in December only eleven calls were completed at the station-to-station rate, and these by accident, not by choice. These eleven calls represented four and three-tenths per cent total number of calls completed. In analyzing the toll tickets for this period, it was found that forty-one calls were made to two firms in Louisville, Ky., indicating that the station-to-station class of service could have been used on these calls. During this same period there were forty-five report charges on calls that were not completed because of cancelling, etc. Frequently a call was filed and when Mr. Grain Dealer received the report that the called party was out, the call was cancelled. These forty-five report charges represented fifteen and two-tenths per cent of the total attempted calls. While this study was in progress, an explanation of the proper use of the station-to-station calls was made and the practice of carrying calls forward for a period of twenty-four hours from midnight of the same day that the call was filed, was explained.

To better illustrate what Mr. Grain Dealer now thinks of using the station-to-station class of toll service, we would like to quote the following figures for the month of March when seventy-nine calls were completed at the lower rate. This represents approximately thirty per cent of the total number of calls showing an increased use of the station-to-station toll service of about twenty-five per cent. This item alone effected a savings in the total bill of about seven per cent. It is also interesting to note that the per cent of report charges decreased nearly fifty per cent in this period. These figures, we believe, show that this user at least made an effort to follow the recommendations.

One of the first service surveys made in Indianapolis was of a commission merchant's business. This firm is a very heavy toll user, having several men on the road calling the office two or three times each day and having charges reversed. About seventy per cent of all the toll calls were collect calls. When this item was discussed with Mr. Commission Merchant he requested that a representative of the telephone company attend one of their Saturday meetings with the road men and the floor salesmen and explain in detail how these calls could be handled at the station-to-station rate. In this case the using of this class of toll service effected a savings of about sixteen per cent or an estimated annual saving of about $900.

Several months after the above survey was completed, Mr. Commission Merchant No. 2, competitor, was having considerable difficulty and not co-operating with the toll operators, caus-

*Courtesy of Bell Telephone News.

ing many lost calls and loss of circuit time. During an interview, Mr. Commission Merchant, No. 2, frankly admitted that all the difficulty in the toll service was at his place of business. He stated this condition existed because he was trying to do more work than one man could carry and that cooperation with the toll operators was one of the things that suffered from this cause. He promised better cooperation in the handling of telephone calls and said he would try to secure the services of a man capable of assisting him in his work. In this case we are glad to report that Mr. Taylor, division traffic superintendent, now states relations with Mr. Commission Merchant No. 2, are satisfactory. During the interview, Mr. Commission Merchant No. 2 said that the Western Fruit Jobbers' Assocition had recommended a more extensive use of station-to-station toll service in an effort to assist its members in taking advantage of cheaper toll rates. And, as he had heard that a competitor was using this class of service on part of his toll calls and saving money, he decided to place all of his calls in this manner. He was like the man who started to take cough syrup. If one tablespoonful would help to relieve the cough, he would take the entire bottle at once and cure the cough. While saving a considerable amount of money on his toll bill, he found that using this plan on all of his toll calls was not entirely satisfactory. An explanation of the proper use of station-to-station service was made. This incident is related to show how the results of survey work travel.

Selling Matches by Phone

A state representative of one of the Match Sales Corporation has been selling matches by both local and long distance telephone. This representative advises that in four days of long distance calling, he sold 538 cases of matches throughout the state. To have covered the same territory and accomplished equal results, this representative said it would have meant six weeks of traveling by train, traction and automobile, and then perhaps some of the smaller places might have been omitted from his schedule. This representative further states that the telephone is the most satisfactory selling medium that he has ever used; that the long-disance service was entirely satisfactory; and that he expects to continue the practice of selling by the medium of the telephone.

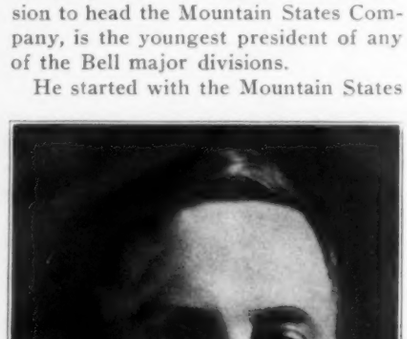
In some cases the employees and sometimes an official of the concern where the survey is being made visit the central office. In practically all cases the private branch exchange chief operator or attendant visits with the chief operator and supervisors at the central office, and an opportunity for discussing the mutual service problem is thus given. An official of one of the large hardware companies, after spending two hours in Main Office said that the time spent in going through the office was not lost but was very educational.

Fred Reid Young Chief

Mountain States Bell President Grew Up in Company He Now Heads.

Denver, Colo.—Fred H. Reid, who returned from the Southern Bell division to head the Mountain States Company, is the youngest president of any of the Bell major divisions.

He started with the Mountain States



Fred H. Reid, Mountain States President

as a mere lad, in 1902, in the office of the general superintendent as a clerk, and moved along to the position of chief clerk to the superintendent, chief clerk to the general manager, assistant to the vice president and general manager, assistant general manager, and now lands at the top of the heap.

Mr. Reid knows the Mountain States territory, its personnel and its requirements from A to Z, and has a splendid record of advancing the property. The Mountain States Monitor, in commenting upon Mr. Reid's return, says: "There can be no greater tribute to any man's character and ability than that shown by a recall to a high position in a community or in an industrial concern where he had made his start. And this is just what has happened in the case of Mr. Reid."

Telephone Company Establishes Radio Department

Spokane, Wash.—The Interstate Utilities Co., with headquarters at Spokane, and operating a number of telephone exchanges in eastern Washington and northern Idaho, has recently added a radio department to its business. It has recently issued a pamphlet describing the radio line which it is carrying and is making an active campaign to place radio apparatus in its territory. In speaking of decision of the company to enter the radio business the pamphlet has the following to say:

"Radio is an advanced step in telephone communication. No other business organization is better equipped for the carrying on of the radio business than the telephone company. The telephone industry has been engaged for fifty years in the problems of transmitting sound. Telephone people, therefore, are more familiar with the complexities of communication than those engaged in any other line of work.

"With these things in mind the Interstate Utiliites Company decided that as soon as the radio business appeared established on a sound foundation the company would go into the radio business. The plan is to sell radio receiving sets through the central offices of the Telephone Company."

Engineering Standards Committee's Code for Building Equipment

New York, N. Y.—The American Engineering Standards Committee has approved, as a "Tentative American Standard," a code of standard symbols for electrical equipment of buildings. This standard code has been worked out under the sponsorship of the American Institute of Architects, The American Institute of Electrical Engineers and the Association of Electragists-International. The latter body is the organization of electrical contractors and dealers. While the symbols deal with all types of electrical equipment, it may be noted that nearly one-third of the total number deal with telephone and other signal lines. The complete sheet of symbols was published in the Journal of the A. I. E. E. for June and copies may be secured from any one of the sponsor bodies or from the American Engineering Standards Committee, 29 West 39th street, New York City. The price is ten cents.

Plan Wire Unity for Europe

Unification of Long Distance Telephone Systems to Supply Service to All European Countries Reaches Promising Stage — Proposals Advanced — Nations in Rivalry

By BRUNO SCHAPIRA

The eminently and permanent successful results achieved by the through telephone service in the United States of America has of late aroused the rather long dormant desire to create a European long distance telephone network. This endeavor is especially manifesting itself in the three leading industrial countries of Europe: France, England and Germany. Each of these countries is striving to secure for itself the position as the dominating center of a projected great unified European telephone cable network. Each undoubtedly is actuated by the same motives, which in the early days of telegraphy prompted England to make its capital, London, the center of news and information service to the world at large, thereby founding and holding a powerful economic position.

The president of the Institution of Electrical Engineers in London, Mr. Frank Gill, who is also representative of the Western Electric Co., some time ago delivered a lecture defining his views concerning this problem.

The English Unification Proposition.

Mr. Gill expressed the opinion that, given adequate facilities, there is traffic waiting to be handled between the cities of Europe, and urged that there are weighty reasons for providing those facilities, such as the present necessity for improving the relations between nations, in addition to the normal commercial advantages. So far as distance is concerned, there is, he said, no engineering difficulty in constructing and operating lines to give satisfactory speech between any one and any other part of Europe. He illustrated this statement by pointing out that between Brussels and Athens, or Paris and Constantinople, the distance is about the same as between New York and Omaha, between which points calls can be made at any time, and that the direct distance overland from London to Delhi (India) is about the same as from Key West in Florida to New York and thence to San Francisco and Los Angeles, over which distance calls can be made regularly.

Results of this kind, however, require the use of elaborate technical devices, such as loading coils and repeaters. Formerly a long distance telephone line consisted merely of a pair of copper wires, which with comparative ease could be kept in good order by independent maintenance units situated along its length. But now that simple structure has vanished, the plant is more complicated, the various parts are interdependent, and it is no longer possible to consider maintenance of each part solely as a sectional matter, since what is done at one place may cause serious effects at another.

Present knowledge can secure great increase in the distance spoken over in the number of channels of communication afforded by one pair of wires, and in the cheapness, security, and speed of service, but a price must be paid for these advantages in the shape of definite and unified planning throughout the area to be covered, with unity of maintenance and of operation. In Europe, however, there are about forty self-contained local telephone operating organizations, which, though they must function for through service, as a whole are without co-ordination, standard practice, or common technique of construction, maintenance and operation; and the through service is meager in quantity, slow and inefficient.

Mr. Gill summarizes the measures to be adopted as follows:

1. All through telephone service in and between the several European countries must be intrusted to and managed by a single long lines company, holding licenses from each government concerned. The several governments should be under obligation to invest the long lines company with due legal rights and guarantee the company the unquestionable good will and the effective support. It appears also desirable to turn over to the company the existing lines and line equipments which are fitted to the through telephone service, either by purchase or on a long lease agreement.

The advantage of this procedure would be an immediate consolidated arrangement. The operations would be conducted on the customary business principles, and, when the tariffs were kept within the proper limits, capital of sufficient importance could no doubt be raised to provide for all

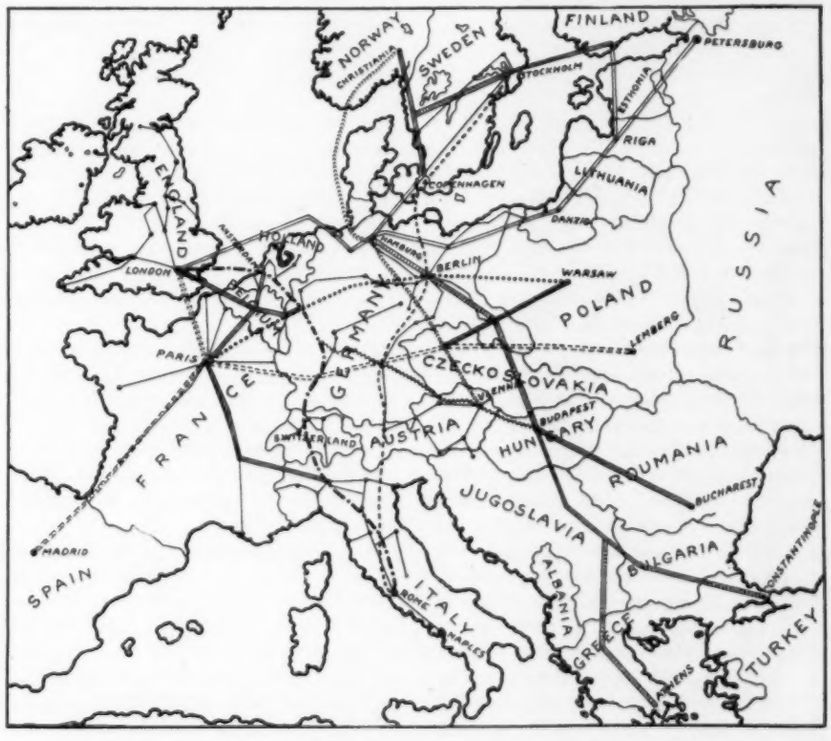


Fig. 1—Showing Operating and Proposed European System

the lines required and their equipments.

2. The second feasible arrangement would be that the several governments co-operated to create a private company, or a commission, to take charge of the functions described in the preceding paragraph and duly authorized from each interested government to operate in the country concerned.

3. A third plan represents only an expedient of a temporary nature and serves merely as an opportunity of studying the difficult problem. The character of this proposition is as follfollows: The several authorities on telephone service should consolidate into a joint committee for the purpose of thoroughly examining this and kindred matters. No doubt an agreement could be arrived at regarding a satisfactory regulation of the transit traffic. Whether the transit traffic is managed by a single organization or by a certain number, in either case there are surely questions urgently in need of being settled, if an improvement of the telephone traffic in Europe is to be realized.

The Western European Conference.

Acting upon the suggestion of Mr. Gill the French government sent out invitations to participate in preparatory deliberations of an "International Technical Assemblage" for dealing with long distance telephone traffic. At this conference, which was held from the 12th to 20th of March, 1923, the following subjects were treated:

1. An efficient technical basis for the telephone communication between the several European countries.

(a) Establishing unified standards for construction and operation of lines.

(b) Creating a managing central organization.

2. Ascertaining and selecting the most desirable technical requirements suited for telephone lines with intercommunication from one country to another.

3. Arranging the manner of operation and the maintenance of such long distance telephone lines.

4. Technical possibilities of organizing interstate long distance communication within the near future on the basis of operating the several telephone main and branch lines in their present condition. The possibility at the present stage of outlining a diagram of intercommunicating telephone lines such as would be required for Western Europe in the near future.

5. To outline a program dealing with the construction, organization and operation principles suited for the several Western European countries, in order to render an up-to-date interstate telephone service feasible.

6. In what manner can the managing central organization for the interstate European telephone service be organized? This inquiry should be conducted from a purely technical point of view (construction, operation, maintenance of the lines and offices), but only put into practice from a distinct financial and administrative point of view.

The program, presenting the results of the deliberations, shall later on be submitted as a line of guidance not only to the countries participating in the conference by delegates, but to all other European countries as well.

At the Paris conference the following countries were represented: England, France, Italy, Spain, Belgium and Switzerland. The main deliberations were carried on by three committees and culminated in the following agreement:

1. A permanent committee with a secretary's office to be established in Paris; the functions of this office are to act as an instrument for obtaining and furnishing all technical innovations and experiences relating to interstate long distance telephone communication. The committee is constituted for members acting as delegates from the various participating countries at the Paris conference. The functions of the proposed committee are put in the charge of the president and secretary of the preparatory committee, until a permanent committee has been constituted. The resolutions of said committee shall be communicated to the several European countries, thus enabling them to take such action as each country may consider advisable to further the idea of unification.

2. All European countries shall enter into an agreement regarding telephone apparatus to serve as a standard type. For the time being a solid-back microphone and a Bell receiver, with certain qualities, will be considered as the standard.

3. The overhead lines, equipped with repeaters intended for interstate communication, are not to use loading coils.

4. Overhead lines shall consist of copper or an alloy of copper and have a diameter of at least 3 mm.

5. With regard to distinctness of speech in communications by telephone the English mile standard cable is recognized as the international standard measurement.

6. Long distance cable equipped with loading coils and repeaters are only allowed to be utilized for interstate communication for a distance not exceeding 1,600 kilometers (for distances from 500 kilometers upward only a four wire connection is admissible.)

7. With four wire connection in long distance cables loading with 24 millihenrys for 1,000 meters (coils of 44 millihenrys at a spacing of 1830 m.) are considered serviceable. With two wire connection (to a 500 kilometer limit) a maximum load with 95 millihenrys should be aimed at, employing coils with 176 millihenrys, likewise at spacing of 1830 m. The wire diameter for long distance cables should on an average amount to 0.9 and 1.3 mm.

8. For long distance cables Pupin coils with compound cores (not with wire cores) should by preference be used. The employment of cables for international telephone communication is considered as generally the most desirable.

9. Repeaters are to be utilized for air lines as well as for cables. They shall uniformly strengthen all the waves in the speech band.

10. A thorough investigation should be made in the several European countries regarding the various derangements arising from high tension equipment.

An examination of the general principles laid down at the Paris conference shows that these more or less are founded on American experience and American methods of operation.

German Long Distance Efforts.

The preceding description goes to show that both England and France are striving to make their own country the center of the European telephone network. England, however, is handicapped from serving as a European center for distribution of communications by virtue of its disadvantageous outskirt position. The same argument holds good regarding those countries which form the European extremities, viz., Spain, Italy, Sweden and Norway; the Balkan countries play of course no part in this respect.

The pre-eminence as a center restricts itself consequently to the countries lying between France and Germany: First of all, these two countries, followed in rank by such smaller countries as Switzerland, Belgium, Holland, Austria, Czecho-Slovakia and Hungary. Among these smaller countries Belgium, Switzerland and Holland command effectively organized telephone lines and service, but their area is so limited that only a relatively small portion of the transit lines would fall within their territory. The other small countries can not be taken into consideration at all owing to the insufficient development of their telephone network and resources. Consequently the two rivals to be taken into account for an interstate transient traffic are France and Germany.

It is therefore obvious that France, arranging the West European Telephone Conference, is actuated by a de-

sire to take the initiative, and is thoroughly aware of that Germany represents a formidable rival in the field of international telephone traffic. The proposition as to organization set forth by Mr. Gill, culminating in a superstate company, has not been indorsed by the Paris conference. On the contrary, this body confined itself to recommending that the telephone administrations of Western Europe, represented at the conference, should establish a council in Paris charged with research and interchange of all technical experiences concerning the practicabilities of long distance interstate telephone traffic. However, the chances that such a superstate company could be organized and put into proper function in Europe within any near future, are very small. Antagonistic political principles between the several countries are too pronounced to favor the realization of that idea. The U. S. A. has the tremendous advantage of representing a vast political and economical unified structure, whereas Europe is divided into a number of regions with conflicting economic interests.

In Germany the efforts to establish a European telephone service are represented by the "Deutsche Fernkabel Gesellschaft" (German long distance cables company), an organization wherein the German governmental telegraphic administration and the largest German cable manufacturers exercise a leading influence. The aim pursued by this company is to enlarge upon and equip existing and prospective German telephone lines in such a manner as to insure their special adaptability not only for intercourse with the neighboring countries, but for the interstate transient traffic as well. According to the information furnished by the representative of the German long-distance cable company, Dr. Craemer, at the recent general assembly of the association of German Electrotechnicians, Verein Deutscher Elektrotechniker, the total length of interurban telephone lines of all the countries participated in the Paris conference represent 900,000 kilometer, while the German telephone lines within the territory of Germany amount to 800.000 km. Furthermore Germany has a very important telephone industry, occupying a position next in rank to that of the United States, and takes the lead in Europe.

The project of a European long-distance line service has been studied and planned by Dr. Craemer on basis of the several already existing European telephone lines and their intended extensions, such as reproduced in figure 1. In Europe as well as in U. S. all parties interested agree that only the telephone cable can be considered as the mainstay of the European telephone network as the airlines are subject to frequent derangements of atmospheric nature. According to calculations made independently in Germany and France the cost of a telephone call via cable is 50 per cent lower on a line of 500 km. long than a similar call by air line. As a matter of fact cables are in operation or in an effective or planned course of construction in most of the European countries of consequence. Germany took the initiative in 1913 with the construction of the Rhine province cable, which has a length of 600 km. which connects Berlin with the Rhine region of industry. However, that cable was not equipped to operate with repeaters and fails thus to embody all up-to-date technical improvements. The construction had to be suspended during the war, causing the cable not to be finished until 1921. It has performed quite an efficient service since then.

The most important European long-distance cable lines would, according to Dr. Craemer, run as follows:

1. London - Hamburg - Petersburg 3800 km. This line follows the route of navigation along the North Sea and the Baltic Sea, connecting the main seaports and constituting at the same time the basis for a cable connection with the northern countries.

2. London - Berlin - Constantinople 4300 km. This cable route connects England and the North Sea ports on the European continent, taking its course across Germany and the central European countries, with Balkan countries and Turkey.

3. London - Amsterdam - Rome 2000 km. Cable route over Holland, the Rhine province and Switzerland to the Italian capital.

4. London-Paris-Madrid 1700 km. Western line to join the English, French and Spanish cable network.

5. Frankfort - Nuremberg - Vienna-Budapest 950 km. Cable route following the Rhine-Main-Danube water route in course of construction connecting with the lines mentioned in paragraphs 2 and 3.

6. Paris-Berlin-Warsaw 1250 km. Cable line crossing Europe to connect the western part, via North Germany, with Poland and later on with the interior Russian territory.

7. Paris-Prague-Lemberg 1400 km. Cable route from western Europe through southern Germany to Tsechko-Slovakia and the southern part of Poland and with a later extension to southern Russia.

8. Christiania - Hamburg - Vienna 1800 km. line from the Norwegian port via Hamburg and then, following the course of the Elbe river, via Prague to Vienna, intersecting the West-East lines.

9. Stockholm-Berlin-Munich - Rome 2000 km. lines from Sweden across Germany and the Alps to Italy.

10. Supplementary lines in different countries with a total of 4200 km.

The total extension of the European cable network in accordance with this project is calculated at 24,000 km. This, however, should only be considered as an approximate estimate apt to require an increase. Under certain circumstances the long-distance cable network project might enter into a combination with the service performed by the European aeroplane lines now existing or in course of being established. Of the total cable extent 6650 km. (25 per cent) would have to be allotted to Germany, owing to the telephone network there being more closely webbed than in other principal countries of Europe. Aside from this fact the geographical position of Germany makes it unavoidable that the greater part of the interstate traffic main lines must pass through Germany.

It can hardly be presumed that the European long-distance cable network will be realized for some years to come. The development can only be a gradual one whereby the cable networks, constructed in the several countries for interior traffic, from the outset should be planned in such a manner as to lend themselves in due time to interstate traffic. These national networks will then gradually be mutually joined, preferably by means of cable or in exceptional cases by aerial lines.

Rochester Plant Department in New Headquarters

Rochester, N. Y.—The Plant Department of the Rochester Telephone Corp. now is located in a new building at 445 St. Paul street. All of the activities of the department now are centralized in the building which was erected especially for this use. It is a steel frame, fireproof building, having a total length of 368 ft. and width of 135 and 35 ft. in different portions. The total floor area is over 45,000 sq. ft. A yard with side track facilities extends to the rear. The front portion of the building is two stories in height, the second story being occupied by the general plant offices and school for construction forces. A comfortable rest room is provided for the girls of the office and a room fitted with chairs, tables, lockers and shower baths is provided for the men. The first floor is used for the garage for the company's automobiles, 65 in number, the auto repair shop, the general store room and the equipment repair shop. A force of over thirty men regularly is employed in the garage, store room and repair shops.

LINE AND DESK

SOME INSIDE WIRING SPECIFICATIONS

The following rules and specifications for running inside wire were prepared by C. W. Kugelman, of the Portsmouth (O.) Telephone Co., and are used by that company. There are a number of suggestions in them which may be used to good advantage by others:

Wherever possible, the telephone is mounted on an outside wall, the twisted pair drop wire is to be brought through tube in wall to the instrument. This applies mostly to country work and rough buildings. When duplex is used for inside wire do not run more than six inches outside.

This also applies when concealed wire is wanted and the drop is taken into basement, attic or a common point of connection for one or more telephones.

Every drop or other wire should have a water drip of about two inches before entering building.

Holes in outside walls to be bored with slope toward outside. When installing ground wire, run it through an extra tube, preferably under line wire. Arresters should be mounted as near the outside of building as possible. Under porch roofs or other protected places if arrester is not weather-proof. Where the drop does not come under porch the arrester will have to be placed as near point of entrance, inside, as possible. Weather-proof arresters are to be mounted on outside of house or on pole from which drop is taken.

Concealed wire should not be tacked or fastened in any way where it is not possible to get at the attachment when building is finished. Wire should be free and in condition to be replaced in case of faulty insulation or installation.

When more than one telephone is wanted, extensions, bring each pair of wires to an easily accessible point of connection with the drop. No concealed splices or connections are to be made.

All splices should be soldered and taped. No splice is to be taped without solder or foil. When splicing two or more pair, use the pig tail method leaving two or three inches of slack in each pair and split the joint in such a way that a short circuit will be impossible.

Wherever the house wire crosses a lighting or power circuit, insulate with tube or loom.

Wiring through floors or walls which are subject to dampness, should be through conduit or lead pipe which shall extend not less than one foot beyond point of dampness and be taped at each end of conduit or pipe to exclude any dampness.

Duplex should be used for exposed interior wire and for concealed wiring where there is no chance whatever of its getting damp or being subject to being pinched by boards or other material and where it can be easily renewed in case of trouble. In no case is more than six inches of duplex to be run where it is exposed to the weather.

Bridle wire or No. 17 copper clad twist to be used in rough places and for concealed wiring where there is any chance of lighter insulated wire causing trouble.

All wiring to be done to conform to the wishes of the subscriber as near as possible.

All special wiring, such as concealed work or fishing through walls and floors, should be paid for by the subscriber at actual cost of time and material. The subscriber will also furnish or pay for special amounts of conduit, moulding or other material necessary or wanted in carrying wires from residences to garages or other out-buildings.

Whenever necessary to remove flooring or other woodwork, notify the subscriber in a polite manner, that we prefer this being done by a carpenter or some one with the proper tools at the subscriber's expense. Should the subscriber insist that we do the work, do it in as neat a manner and at least expense possible, but at the subscriber's risk of breaking or cracking material.

On ordinary jobs, the company will furnish the wire free of cost if the subscriber wishes to furnish the labor and other material.

The company will not be responsible for condition of wire installed by the subscriber or contractors unless supervised or inspected by a competent employe and O. K.'d by him.

All wire to be run in neatest manner possible and enough slack left at instrument to permit its being disconnected and reconnected without splicing.

Open wire in corners should be tacked each side of corner. Tacks should be used not less than three feet apart on straight runs.

All jobs should be done as neatly and quickly as possible; but special care should be used on newly papered or plastered walls. Use extra care in working on new floors or woodwork. Under no circumstances do we want the subscribers to have a complaint regarding scratched or otherwise injured property. Always clean up any dirt made in or around the premises. Trouble men shall take time to replace any inside wire which is loose or otherwise looks bad.

All wire has tags which shows the kind, size and manufacturer's name. Please mark amount and kind on your returned work or installation orders. This is important.

Removals

No employe is to enter a house for the purpose of removing an instrument, if there is any furniture or other material in the house, without the consent of the property owner.

The kind of telephone removed should be noted on all orders.

WHO CAN BEAT THIS RECORD?

A remarkable record for economical operation of a trouble car, made by James C. Pride, toll line repairman, covering the Lansing area of the Michigan Bell Telephone Co., was described in a recent number of "The Mouthpiece."

Here are some of the figures: Driven, 28,000 miles; repair cost, per mile, $.0028; total local expense, per mile (gas, oil, tires, repairs), $.019; total operating cost, per day (includes license, depreciation, storage, insurance, etc.), $1.77.

Mr. Pride had only one complete set of cord tires placed on his car after the original fabrics wore out. Through careful attention to vulcanizing cuts, the cords were in such good condition that they were placed on another car when Mr. Pride's car was turned in.

INFECTION A HAZARD IN CABLE WORK

We have many cases of infection among cablemen caused by neglect of a scratch or cut by copper wire and copper slivers. The verdigris in copper is poisonous and infection from a copper sliver will cause discomfort and pain to a man for several days if neglected.—Arthur Hindle in "Telephone Topics."

BUILDING CABLE CREW HAS NO CINCH, EITHER

With practically every office building, hotel, department store, factory, apartment-house and municipal building provided with cable and terminal facilities, one can realize that the building cable crews have no cinch job.

The service cable, aerial or underground, entering a building in the basement or lower floors is terminated at a service terminal. Local or house cables extend from this to the upper floors, with terminals at various locations.

Much of the cable is placed in pipe conduit or cleated to walls. It is often located in elevator or wire shafts, tunnels or laid in wooden moulding. The main thing in all building cable jobs is to get the cable placed securely where it is not against steam pipes, electric wires or other objects likely to cause cable trouble. To obtain that result, the cablemen must and do show a great amount of skill, ingenuity and patience. Sometimes the conditions under which they work are far from ideal. However, due to the very nature of their work and considering the necessity of placing cable as stated above, they accept the conditions as part of the job. Just compare two different jobs, in one of which the cable is cleated along an outside building wall and in the other the cable being placed in a tunnel where the light is bad and the temperature is close to 100.—C. M. Williams, in "The Mouthpiece."

STRAIN INSULATORS IN GUY WIRES

A subscriber makes the following inquiry regarding the use of strain insulators in guy wires:

"I have noticed that some telephone companies are using insulators in guy wires like the electric light companies have been doing. I can not see the use of this. Can you explain the reason for it?"

The reason for the insertion of strain or break insulators in guy wires is primarily one of safety. Many telephone companies are following the recommendations of the National Electrical Safety Code, although the cost of the guy is increased somewhat by the additional insulators and clamps required and by the increased cost of labor of installation. The practice recommended will be found in Sections 212 and 213 of the N. E. S. C. and what is said here is based largely upon these sections and the discussion of the sections as given in Bureau of Standards Handbook No. 4.

In brief, the requirement is that a strain insulator be inserted in a guy wire when the pole carries electrical supply lines of over 300 volts and under 15000 volts or if the guy wire is exposed to such lines. It is considered that the hazard is not sufficient to require insulators if the electric line voltage is below 300. Above 15,000 volts the insulators can not be depended upon. The insulator is provided to prevent accidental contact with the grounded guy wire by a man working on the pole or to prevent contact by passers-by in case a live wire come into contact with the guy. The insulator should be so placed that in case the guy breaks, the ungrounded portion will clear the earth by at least 8 ft. This is shown in Fig. 1a.

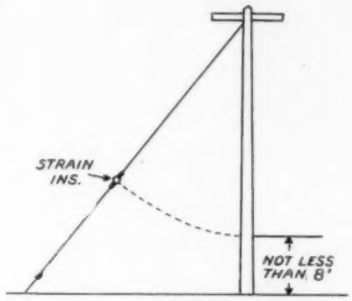


Fig. 1-A

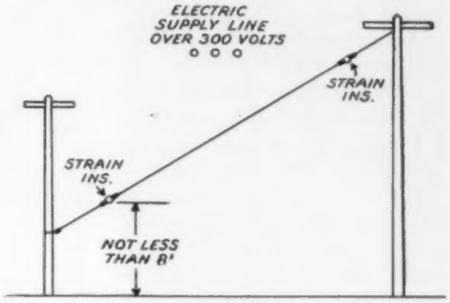


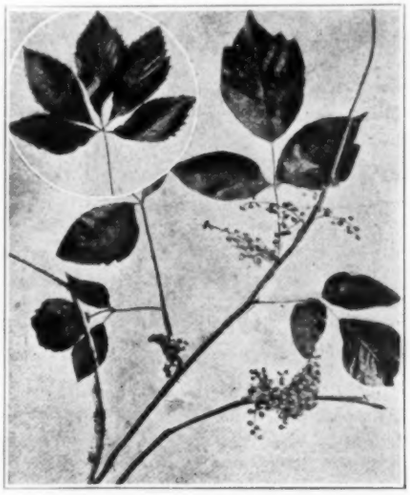
Fig. 1-B

In some cases a single insulator will not remove the hazard and two insulators are necessary. Such a case is illustrated in Fig. 1b. In this case neither insulator should be less than 8 ft. from the ground in order to avoid the hazard in case of a break in the electric line or the guy wire. In some cases a study of the situation will be necessary to determine the exact location of the insulators to eliminate the hazard.

BEWARE OF POISON IVY THESE DAYS

The leaves and branches of poison ivy or poison oak contain an oily, resinous juice or sap, a very small portion of which will cause an intense irritation of the skin. Poison ivy grows everywhere in this latitude; in the woods, along the paths and fence rows and over the ground, and adapts itself practically to any soil condition.

It often is confused with the beautiful Virginia creeper, which it resembles in appearance and habits of growth, but may be distinguished by the fact that it has three leaflets growing together, while the leaves of the Virginia creeper grow in clumps of five.



Poison ivy is the spray with leaves in clusters of three, while Virginia creeper (in the circled inset) has leaves growing in clumps of five.

The leaflets of the poison ivy grow on stout, rather long stalks, and at maturity the upper surface is dark green, the underneath being lighter and sometimes velvety. Two of these leaves are opposite and short stalked, while the end leaflet is long stalked. Very often there are small wart-like growths on the leaves and stems. The leaves are pointed, with jagged edges, although there is considerable difference in the size and shape of the leaflets.

This is exceptionally well illustrated in the accompanying photograph, which was taken from one of the bulletins of the United States Department of Agriculture.

In autumn the vine has whitish waxy berries which look somewhat like mistletoe berries, and the leaflets are beautifully colored in various shades of scarlet and orange at that time of year. When gathering colored leaves in the autumn, never touch any which grow in clumps of three, and at all seasons when in the country avoid any climbing vine or plant which has pointed leaves growing in clumps of three.

The poison is not volatile, in spite of popular ideas to the contrary. One must come in actual contact with the plant, or with something that has come in contact with it, to become contaminated. Direct or indirect contact must occur. The poison may be carried on the clothing, on tools or by insects. Smoke from the burning vine, in a brush pile or on firewood, may be a mechanical carrier of the small oil globules, and may cause the irritation.

The hands and face are the parts most often affected, but it is easy to

transfer the poison from the hands to other parts of the body. The irritated skin heals very slowly as a rule, and is most uncomfortable and disagreeable.

If contact is known to have taken place, wash the exposed parts as soon as possible with soap and warm water, scrubbing thoroughly with a brush, and repeat several times, changing the water frequently. Discard or have cleaned any clothing which may have come in contact with the plant. If the washing is not done thoroughly, it tends only to spread the poison.

When not washed off, it causes an intense irritation of the skin with redness and swelling and often with the formation of small blisters. The contents of the blisters is not poisonous, and will not cause new blisters to form.

While most individuals are susceptible, some persons can handle poison ivy without being poisoned. Persons once affected are believed to be more susceptible, however. It is said that one may acquire immunity by taking a decoction made from the leaves of the plant in small doses, gradually increasing the dose. Such a method of immunization is described by Dr. J. F. Schamberg in the Journal of the American Medical Association for October 18, 1919 (Vol. 73, page 1213), and another by Dr. Albert Strickler in the Journal of the American Medical Association for September 17, 1921 (Vol. 77, page 910). Dr. Schamberg's formula consists of a 1 per cent solution of a tincture made from the leaves of the plant, in a little alcohol and syrup of orange, and the dose begins with two drops, and increases steadily until a dose of a teaspoonful well diluted in water is to be taken once a day.

Another remedy made from the plant that is said to be effective is put up in pills called "Rhus Tox," and can be obtained from drug stores handling homeopathic medicines.—Dr. William Cabell Moore in "The Transmitter."

A SUGGESTION FOR TYING UP CABLE SLEEVES

No doubt many have tried to find something permanent to replace marlin house line for tying up cable splices. The marlin must be replaced from time to time and there is always the possibility of the splice cracking if a tie breaks. I have used a piece of cable sheath tied together, also No. 14 iron wire. These are both good but sometimes damage the sheath. Some companies are now using No. 16 annealed tinned copper wire; this tie looks good but I am doubtful whether it will prove satisfactory.

I have found that the only satisfactory substitute for marlin is No. 17 copper clad drop wire. Unwind the twisted pair and use one strand to make the regulation tie. From the ground properly made tie looks identical to a marlin tie. This tie is permanent and will not injure the sheath in any way. I have some of these ties that have been in service for several years and they are in practically the same condition as the day they were made.—Contributed by Ray Blain.

Kellogg Transmitter and Broom Handle for Radiocasting

A radiocasting transmitter used by A. M. Crichton, of Uniontown, Pa., who operates the amateur radio station 8BRM, is shown in the accompanying photograph.

Mr. Crichton had on hand a Kellogg telephone transmitter which he mounted on a broomstick and used in his radiocasting. He thought nothing more of it until he began receiving post cards from different parts of the states, advising him of the remarkable clarity with which his voice was received and the perfect modulation.

Efficient Radiocasting Microphone.

The Kellogg Company comments on this case, saying: "We have received a number of reports of people using our standard telephone transmitter for broadcasting purposes with unusually good results."

Watch Your Spacing When Abbreviating

"Prs" is the standard abbreviation used in the plant department for telephone wires. When the wires have no current coming over them, they are called "dead."

A new typist when given a handwritten report to copy in which were "2oprs dead in a manhole," wrote it, "2 operators dead in a manhole."—"Telephone Review."

Lithuanian Telephone Business Is Growing

Kovno, Lithuania.—The telephones in Lithuania are owned by the Government and are under the control of the Department of Ways and Communications. The telephone was practically unknown in Lithuania for general use until installed in 1915 by the Germans at the time of their occupation of the country. The apparatus was, however, recently replaced with apparatus manufactured in Esthonia by the Tartu Telefoni Wabrix A. S. The central exchange office at Kovno accommodates 1,012 subscribers. Nevertheless, the number of telephones now in use is twice what it was a year ago. There are 44 operators at the central exchange and besides giving local service a long-distance service is maintained to all parts of Lithuania, to Latvia, and to points from Kovno to Konigsberg, East Prussia, and to Berlin. A few banking establishments have installed private branch exchanges, and the central office has provision for 200 such branches, says *Commerce Reports.*

Telephones Decrease Under Soviet Regime

Russia has only 112,000 telephones to serve a population of 131,000,000 people, according to the latest figures available. In other words, there is one telephone for every 1,169 people in the Soviet Republic, as against one telephone for every eight people in the United States at the same date. The Russian government telephone system showed an actual net decrease during a single recent year of about 58,000 telephones, and the mileage of telephone wire in service also dropped substantially.

During 1922 the population of Petrograd increased from about 700,000 to over 1,000,000; but the number of telephones in operation in that city decreased in the same period from about 40,000 to 8,966. Even in Moscow, the capital and center of Soviet activity, the number of telephones fell during 1922 from over 54,000 to about 25,000, although the population grew in the same period from 1,028,218 to 1,511,025.

Here's a Hot Weather Joke

William Nelson, chief tester, Walnut exchange, Des Moines, Ia., is quite a wag. When an order came in for a telephone for Miss Helen Summer, he had the service order assigned to Installer Jack Frost.—From "The Northwestern Bell."

The Spirit of Pioneering

Impatience with present facilities, a restless searching for perfect things—these have driven men to discovery and invention. They possessed the early voyagers who turned their backs on the security of home to test opportunity in an unknown land. They explain the march westward that resulted in this settled, united country. And they have inspired the activities of the Bell System since the invention of the telephone.

The history of the Bell System records impatience with anything less than the best known way of doing a job. It records a steady and continuous search to find an even better way. In every department of telephone activity improvement has been the goal—new methods of construction and operation, refinements in equipment, discoveries in science that might aid in advancing the telephone art. Always the road has been kept open for an unhampered and economic development of the telephone.

Increased capacity for service has been the result. Instead of rudimentary telephones connecting two rooms in 1876, to-day finds 15,000,000 telephones serving a whole people. Instead of speech through a partition, there is speech across a continent. Instead of a few subscribers who regarded the telephone as an uncertain toy, a nation recognizes it as a vital force in the business of living.

Thus has the Bell System set its own high standards of service. By to-day's striving it is still seeking to make possible the greater service of to-morrow.

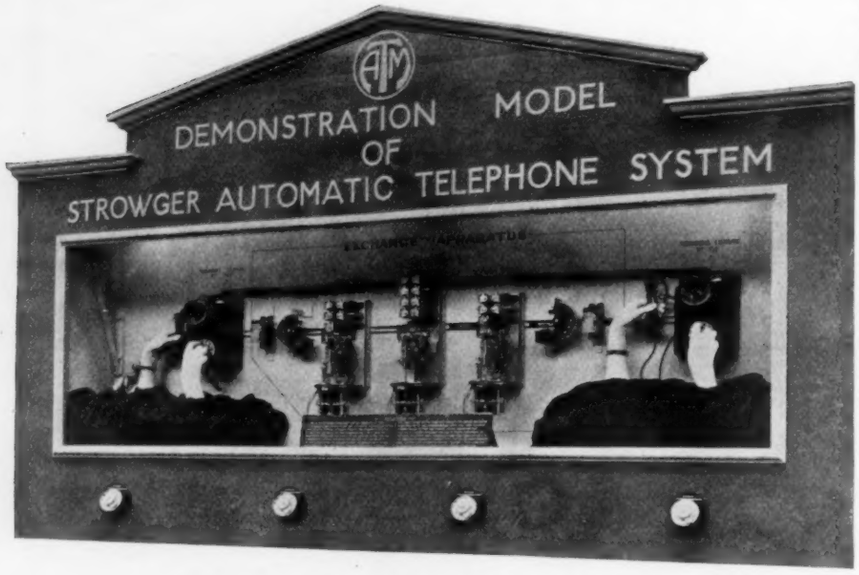
AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

BELL SYSTEM

One Policy, One System, Universal Service

Show Britons Dialing Details

Strowger Automatic Demonstrated at Wembley



Showing Switches Used in Building Up Connection

London, Eng.—The opening of the British Empire Exhibition at Wembley coincides with the beginning of the Strowger Automatic telephone era for London, installation of the new Strowger system in that city having just begun.

As was announced in these columns some months ago, the British Post Office, after fully investigating the possibilities of the Strowger system for London, decided to adopt this equipment for the whole of the London area, and placed orders with the Automatic Telephone Manufacturing Co., Ltd., Liverpool, the British licensees for the Strowger system, for the large initial installation.

The adaptation of the Strowger system to the peculiarities of the London telephone network involves such unusual engineering features that arrangements were made jointly by the British Post Office and the Automatic Telephone Manufacturing Co., Ltd., to exhibit complete models of the London installation so that visitors to the exhibition could see for themselves the method to be employed in handling telephone traffic in London when the "transition period" commences. The demonstration equipment is so constructed that telephone engineers visiting the exhibition can obtain a very convincing demonstration of the engineering features of the Strowger Automatic Director System.

Front View of Exhibit Showing Model Units to Be Used in London's New Telephone System

The exhibit shown in the accompanying illustration, represents two main automatic exchanges, Richmond and City; one automatic satellite office, Petersham; one manual section with automatic equipment to represent a mechanical tandem exchange, and one manual section representing A and B positions in a typical common battery manual office (Dalston), the B position being equipped with call indicator apparatus.

Both the City and Richmond units are fitted with directors, first code selectors, first group selectors, second group selectors and connectors, while there are also incoming selectors and repeators for the trunks from and to the mechanical tandem exchange. The Petersham unit is fitted with switching selector repeaters, digit absorbing selectors and final selectors, together with two-way second group selectors and outgoing secondary line switches for tranks to Richmond.

The following types of calls can be demonstrated on the exhibit:

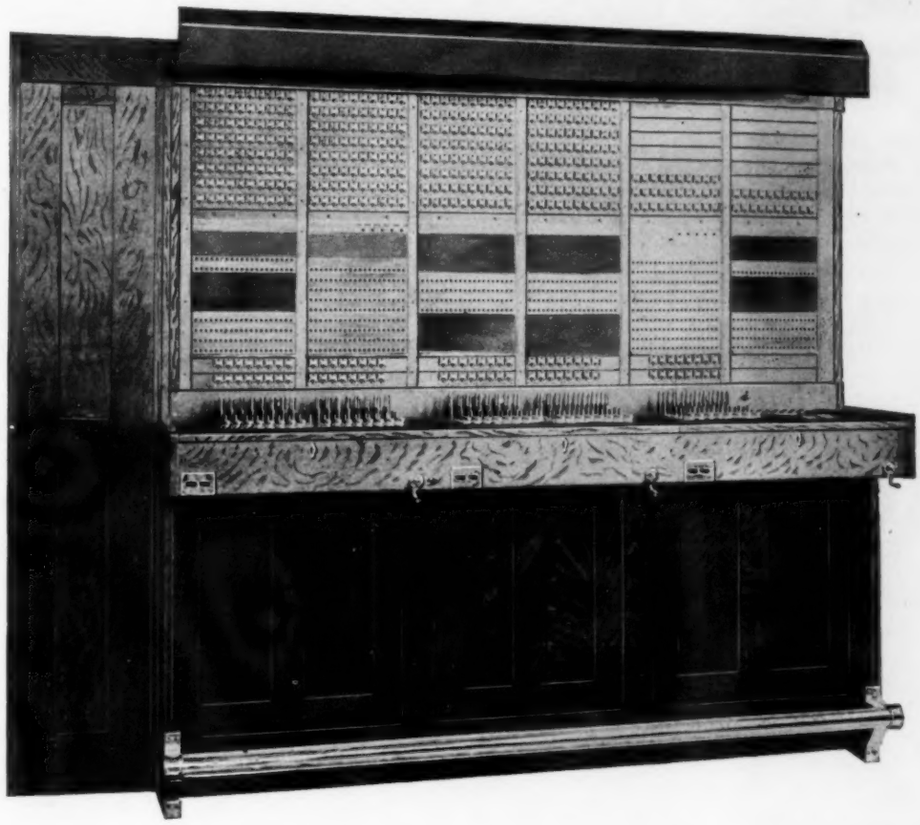
1. *Automatic to Automatic.*
(a) Main Office to other Main Office.
(b) Main Office, Local.
(c) Main Office to Satellite.
(d) Satellite to Main Office.
(e) Satellite, Local.
2. Automatic to Manual.
3. Manual to Automatic.

Another illustration shows one end of the booth at which is placed a working model, demonstrating the necessary processes to be followed in setting up a call on Strowger equipment. It consists of two wall sets, two rotary line switches with line and cut-off relays, two group selectors, and one connector.

At each end of the model, a pair of life-size wax hands are mounted, and by means of a motor driven cam shaft, hidden from sight, the hands in turn go through the operations of removing the receiver from the hook and then dialing.

The two operations control the chain of switches in exactly the same way as if the control was affected by human hands, and the bell at the called telephone is rung from the final selector in a standard manner.

As the call is extended from the line switch to the group selector and from this to the connector, shutters on which arrows are painted, show call progress.



Dual Supervision At Low Cost

Lamps and Visual drop signals used.

Switchboards as small as 50 line capacity can now be operated economically with the new Leich Combined Lamp and Drop Supervisory System.

A. C. Power Used As Source of Current

Current is supplied from power lines by small transformer for both the lamps and restoring feature. Cost for operating reduced to a minimum. No batteries or charging devices required.

Method of Operation

Cord Supervisory lamps in the key shelf are controlled by clearout drops in the face of the board. Recall lamps remain lighted until signal is answered. Recalls put lamp out during signal period. Lamps and clearout signals restored directly by operator's key.

Emergency Equipment Always Ready

Power interruptions affect the lamps only. Drops give good supervision during emergency period, are manually restored when current is not available.

Quotations on request.

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B-R ELECTRIC COMPANY
Kansas City, Mo.

Trouble Shooting Efficiency

Develop Practical Method of Locating Faults

By CHRIS STEWART

One day the plant chief and wire chief of a progressive telephone company were discussing ways and means of lowering the cost of clearing trouble. While they were talking, a lineman called in for a test.

He was working on a rural line, looking for a short circuit, and had come to a junction pole where the line went three ways. Calling in on another line, he asked for permission to open the line, as the roads were bad and the line went two miles to the north, two and one-half miles south and straight ahead three and one-half miles.

It was now up to the wire chief to either let the lineman guess at it and trace out each of the branches until he found the trouble, or open the line. Inasmuch as the roads were bad, he was allowed to open the line for test. If the roads had been in good condition, he would have been told to take a chance and trace out the trouble.

Then an idea came into the wire chief's head. Why couldn't a lineman's

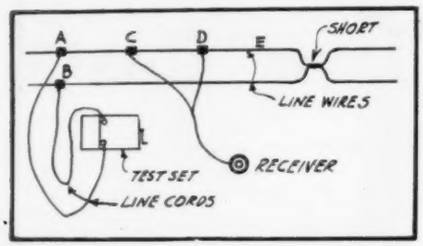


Fig. 1—Showing Operation of Test Set

test set be so constructed that the lineman could tell which way the trouble was without opening the line?

If the lineman in this case had a test set that would do this, he could tell from the junction pole which branch to go out on to clear the trouble. That would save the time necessary to open the line or the time of traveling the branches that were clear; or, in case test connectors were used, the cost of test connectors.

The main object to be overcome was to properly intensify the current from the generator and to provide an indicator sufficiently sensitive to indicate the flow of such a small current on the line. All this had to be done and still have the set rugged, of small size and simple of operation, so that it would stand the rough usage of the lineman. The cost also had to be kept down to make it practical. The set, as worked out, operated as follows:

The line cords are connected on the line wires at A and B, Fig. 1. The intensified current passes out over the line, starting at A to the short circuit and back to B.

The receiver, a special low-wound type, is connected to one of the line wires at C and D. The current passing over line wire A splits at C and some of it goes through the low-wound receiver and produces an audible sound similar to a ring

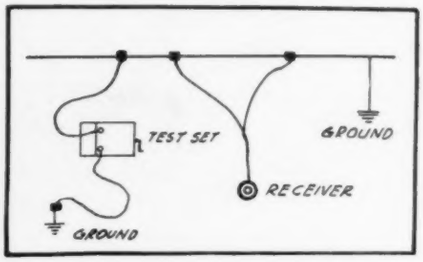


Fig. 2—Locating Ground with Stewart Set

in the ear. If the line cord A were taken off and connected at E, no sound would be heard—because the receiver would then not be in the current-carrying circuit.

A ground can be located by connecting one of the line cords to ground as shown in Fig. 2. When locating a cross, the line cords are connected to the two crossed wires. Bells across the line would not affect the test because the intensified current would not pass through them.

The problem of telling in which direction the trouble was from the tester being solved, a practical indicator, which would show whether or not there was trouble, was next to be devised.

After much experiment it was found that a lamp of proper construction could be arranged in the cricuit so that a clear line would show no light while a short circuit would show one. Bells across the line would not cause the lamp to show. If the short circuit were nearby, the lamp would show bright. If the trouble were far away the lamp would show dim. In this way the tester could tell how far the trouble was from him.

Thus was obtained a set that would tell about how far trouble was from the tester, and which way, without opening the line. This meant that all junction-pole connections could be soldered, no test connectors used, and there would be no opening of lines for testing, leaving unsoldered joints.

The set was so arranged that the switch which changed the generator current to the intensified current worked automatically so the lineman could not take his receiver off the set to test direction without operating the switch. By using a special tungsten steel generator, all this could be accomplished, and the set was only 7 in. by 4 in. by 6 in. and weighed but seven pounds.

Inasmuch as a magneto was used to furnish the current, and a receiver for indicating purposes, by making a special induction coil and putting in a transmitter, the set could be used as a portable telephone.

In designing a battery for this set, it was considered advisable to have a battery which had more life than a flashlight battery and one that would not freeze out. The ordinary flashlight battery is so small that it will freeze out on a cold day and its life is too short as it does not have enough active material. It was found that a 3-volt battery, 1½ in. by 3 in. by 3 in. would give a long life and not freeze out. A push button cuts in the battery when talking.

The set was placed in use by the telephone company in question. It proved so satisfactory, saved so much time and trouble that it was decided if it was

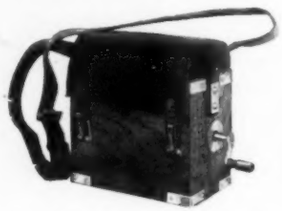


Fig. 3—The Set Is Weatherproof

good for this company, it would be good for others.

A patent was obtained and the set further improved so that it was when finished considered by many authorities

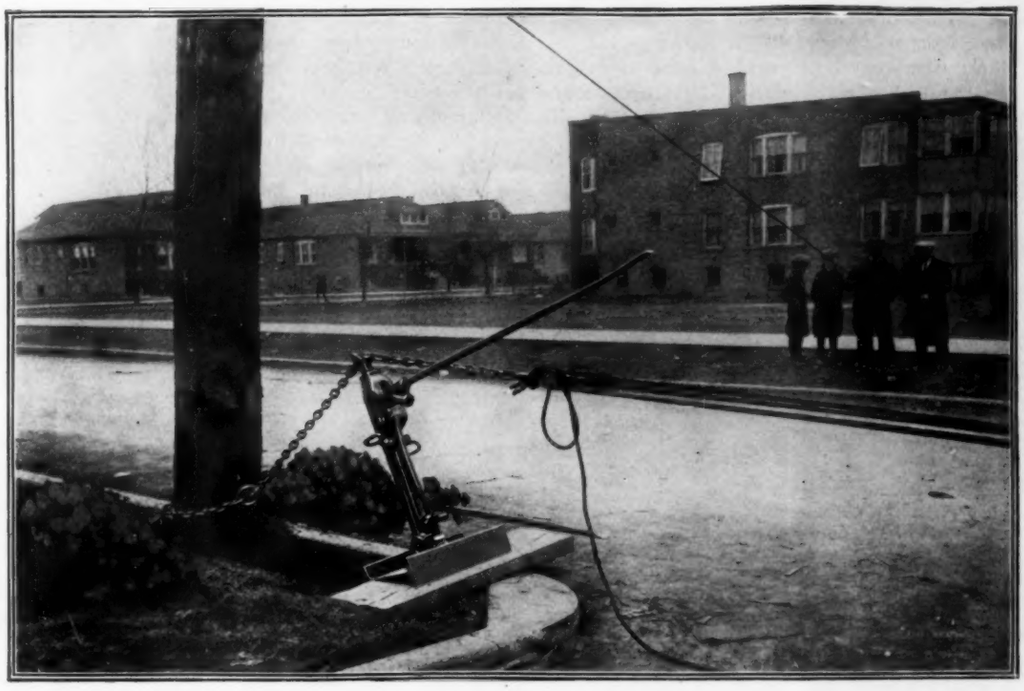
Fig. 4—Lineman Steadying Set

the most practical efficient test set ever sold to telephone companies.

A leather top cover was put on to protect the set from dust, rain and snow, etc. Fig. 3 gives an idea of the finished set. The shoulder strap was provided with a ring and hook on one end of the

"Jack 'em out" SIMPLEX "Jack 'em out"

Simplex Jacks Move Loaded Poles without Interrupting Service



JACKS JACKS

Every so often there is a loaded pole to move.

It's a simple job with the No. 329 Simplex Pole Jack.

A few heaves on the block and tackle takes up the slack in the chain.

Then—with every stroke of the lever bar the loaded pole step by step moves to its new location.

It saves time and money to hang jobs like this on Simplex Jacks.

For details write to our nearest Distributing House or Western Electric Company, 100 East 42nd Street, New York City.

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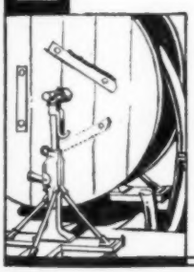

set so that it would be brought into the best operating position, thus allowing the lineman the free use of both of his hands.

Fig. 4 shows how the set is steadied by the lineman, while ringing and listening as is necessary when testing for direction.

In Fig. 5 is shown the position when used as a talking set. The set is brought up on the chest so as to have the value of the chest transmission, as well as keeping the set free from pole vibration, etc.

As an illustration of how easily trouble is cleared with the set, an ex-

Position of Set Used as Talking Set

planation of the actual clearing of a case of trouble follows:

A lineman comes down to the office and the operator says rural line No. 40 is out of order. He takes the test set and rings out on the line. The lamp shows medium bright or shows a short circuit out about five miles.

The lineman takes the set and goes out on the line. When out about four miles he comes to a branch line. He knows the line runs ahead three and one-half miles and three miles south. He climbs the pole, tests the line and the lamp burns much brighter, showing he is now near the trouble. He tests for direction and the trouble shows to the south. He drives down the south lag about a mile and a half. He should have found the trouble.

He tests again for direction. This time the trouble tests back of him. He goes back about one-half mile and the short shows by the direction test to be up a lane toward a house that is on this line and the line seems to be clear to the house. To make sure he tests on the line just outside and the trouble tests in the house.

The telephone looks all right. He disconnects it from the line. The telephone rings clear, but the set when connected to the line wires shows short. He traces out the inside wire and finds that some furnace men had broken the wire and in attempting to splice it, had let the bare joints get together, short-circuiting the line. This would be a hard case of trouble to locate were it not for this set.

Cedar Veteran Begins Drive for Telephone Business

Milwaukee, Wis.—C. P. Tinkham, who is well known in the cedar business, is now making an offering of selected poles from northern and western cedar stocks which has developed considerable telephone business for him since the first of the year. Mr. Tinkham's connections in the cedar industry and his wide and long experience in this business supply a splendid background for his campaign for telephone trade. He is paying particular attention to picking for his customers the choice of available stocks and offers strongest assurance that his shipments will meet the most rigid requirements.

Details of the Tinkham northern and western cedar offerings may be had upon request addressed to his headquarters at 1011 Majestic Bldg., Milwaukee, Wis.

J. Lew Gugler Made Galion (O.) Manager

Galion, O.—J. Lew Gugler, who has served as vice-president of the company for a number of years, will take the position of manager of the Galion Telephone Company, and H. L. Barnes, who has been the local manager for some time, will be transferred to the position of wire chief for the company.

Conventions Make Six Uses of Telephone Wires

There was a time when only telegraph messages were sent over wires. Later, Alexander Graham Bell sent voice messages over wires through his telephone. But the rapid advancement of our present methods of communication went on, and not long ago means were devised to send both telegraph and telephone messages over the same wires at the same time. Now this startling feat has been pushed into the background.

Six separate and different uses of telephone wires were made during the Republican convention at Cleveland and the Democratic convention at New York. The wires were used for local telephone purposes, for long distance telephone, for telegraphing news stories to newspapers, for connecting up the public address system at the conventions, for connecting sixteen radio stations scattered over the country which broadcast the convention proceedings, and for sending photographs by telephone.

Abilene. — Another exchange became a part of the United Telephone System August 1. With the purchase of the Russell Telephone Company the United has added its fifty-eighth exchange to its system. The purchase is made subject to the approval of the Utilities Commission.

Our Literary Digest

Review of Recent Publications on Telephony and Allied Subjects

Toll Reference and Text Book. Published by the United States Independent Telephone Association.

At the 1922 convention of the United States Independent Telephone Association it was requested that a new book of instructions for handling toll traffic be prepared. A committee was appointed for that purpose and the present publication is the result of over one and one-half years work by that committee with the assistance of a number of traffic officials and instructors. It is designed to be used as a text book and a reference book as well. The material is divided into 10 sections, each covering one division of the toll operator's work. These sections are conveniently arranged so that they may serve as definite assignments for student and other operators under instruction.

It is not often that the same book will serve in an entirely satisfactory manner for a reference book when its primary purpose is a text for instruction purposes or vice versa. In the present publication, it would seem that the two purposes had been joined admirably. The complete reference index and the system of topical heading at the side of the page make it convenient for reference to any particular detail of operating practice. The practices described are standard and will fit in with the practices of the Bell long distance lines as well as apply to Independent lines. Smaller companies will find and use the sections that apply to their own conditions and those they meet when connections are built up on other long distance lines. Last of all the loose leaf form permits of corrections and changes without the necessity of revising the entire book. Copies may be secured by ordering directly from the office of the association.

Here's a Durable, Cheap Binder for

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Camas, Wash.—Visiting telephone engineers pronounce the plant of the Camas Telephone Company one of the best of its size in the world, a judgment which is endorsed by the Camas Telephone subscribers.

"Little, But Oh, My!" the Model Camas Plant

The company now has its headquarters in the new building it had erected last fall. Management of the Camas company is in the capable hands of C. W. Vail, for 16 years with the Pacific Telephone & Telegraph Company. Two years ago Mr. Vail became the Camas manager and the company has made a decided growth under his direction, adding 150 subscribers last year.

Texas Holds District Meet at Houston—She·man Next

Houston, Tex.—Fifty attended the district meeting of the Texas Independent Telephone Association held at the Bender Hotel to discuss "Efficiency."

L. S. Gardner of Waco, secretary of the association, was the presiding officer at the morning session, while Earl Evans was the chairman at the afternoon meeting.

L. M. Moore was the leading speaker on the program and gave a talk on "accounting and its relation to the telephone business."

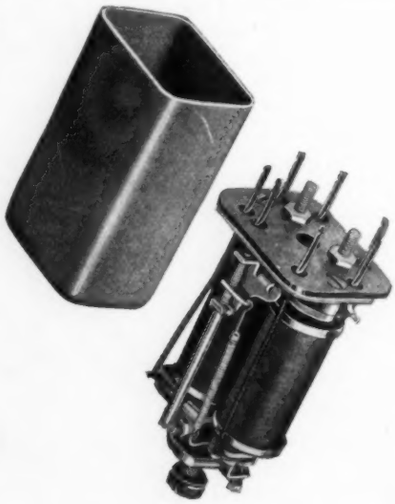
The subject of a speech made by George McQuaide of Dallas was "Government and the Public Industry." He is director of the Texas public service bureau at Dallas.

W. B. Kellogg of the Houston office welcomed the members with a short address.

The next meeting will be held at Sherman Aug. 13 and 14.

Kellogg Relay Claimed Ideal for Alarm Work

The No. 546 type polarized relay manufactured by the Kellogg Switchboard & Supply Company consists of two coils, a permanent magnet and an armature, similar to those used in a standard polarized telephone ringer. The relay has a make and a break contact. These contacts have platinum points mounted on adjusting screws. The armature is controlled by a biasing spring with micrometer screw adjustment. The manufacturers call attention to the fact that these fine adjustments permit very close setting, making it possible to operate the relay continuously on closed circuit work with dry battery current.



Kellogg's Polarized Relay

This relay can be so adjusted that the current flow which holds the contact open will not reoperate the relay in case the circuit is broken and again restored. This feature is especially desirable in alarm circuits, as after the circuit is broken a reconnection will not shut off the alarm.

The reoperation of the relay can only be brought about by some one who knows the circuit.

A relay of this type has a wide variety of uses where low current consumption and extreme sensitiveness is required.

Announce Program for Bell Pioneer Meeting

New York, N. Y.—National Secretary R. H. Starrett of the Telephone Pioneers of America has announced the tentative program of the eleventh annual meeting of that organization of Bell veterans. The meeting is to be held at the Edgewater Beach Hotel, Chicago, October 10 and 11. An informal entertainment under the auspices of Theodore N. Vail Chapter No. 1, and a visit to the Western Electric plant at Hawthorne will be among the high spots of the program. Complete details of the meeting, and hotel reservations are being handled under the supervision of Mr. Starrett, at the Pioneers' headquarters, 195 Broadway, New York.

Horace F. Hill Dies at Age of 64

Chicago, Ill.—Horace F. Hill, for many years vice president and general manager of the Chicago Telephone Co., now the Illinois Telephone Co., died July 18 at Green Harbor, near Boston, Mass. He was 64 years old.

Mr. Hill was born in Boston in 1860, where as a young man he worked for fifteen years in the postal service. In 1892 he went with the American Telephone and Telegraph Co. and helped develop the long distance telephone service. Later he was general manager of the Central Union Telephone Co., covering Illinois, Indiana and Ohio, including the Chicago company and others. He held this position until 1890, when he retired from business.

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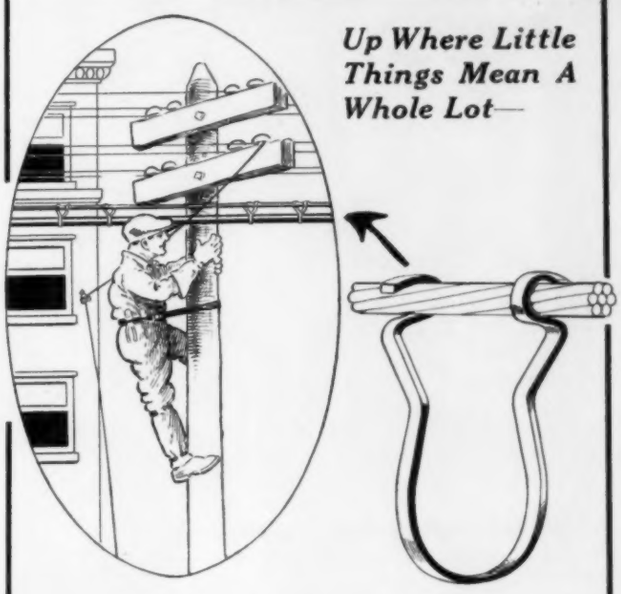

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Linemen say Nationals are a cinch to put up—no muscular fatigue to the hand and wrist.

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Al. J. Johnson, Supply Agent, Making Business Hum

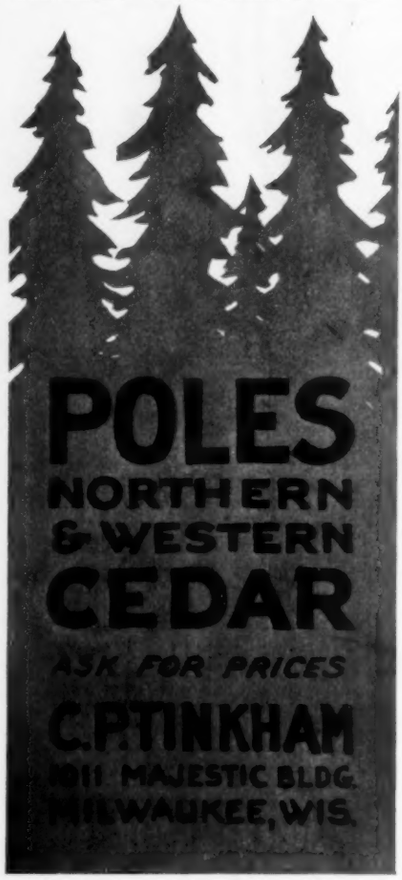
Chicago, Ill.—Alibis of presidential year, general business torpidity or any other of the well-worn stalls don't work when a fellow who is steadfastly addicted to three square feeds a day starts into business on his own hook. This decision, made by Al J. Johnson when he started into business at 217 S. Desplaines street as a manufacturer's agent, probably is responsible in a good measure for the success Johnson has registered.

Johnson, who looks like he might be a year or two out of high school, really is somewhat of a veteran in the telephone supply business. The first job of any moment he ever had was with the American Electric Co., a goodly number of years ago. From the American he went to Stromberg-Carlson and eventually became purchasing agent of supplies and supply sales manager before starting in on his own.

Now from his Chicago office he is handling Brazil vitrified clay conduit, Superior insulating tape, Dover guaranteed element electric switchboard soldering irons and Victor dry batteries, with stocks of all lines except the conduit, carried at Chicago. Business has shown great increase each quarter of Johnson's experience as a manufacturers' representative, and he expects the orders of the coming autumn to be far in excess of any previous time, basing his hope on present indications.

New York Distributes Over 3,000,000 Directories

New York, N. Y.—The summer issue of the New York City telephone directory, largest ever issued by the New York Telephone Co., weighs nearly five pounds and is made up of 1,920 pages. The addition of nine new central offices brings the total up to 140. A total of over 3,000,000 directories will be distributed to subscribdirectory contains 830,000 telephone numbers. A total of 330,000 changes and additions in listings were made since the previous issue. The new diers in the metropolitan area, including New York City, Westchester, Putnam and Rockland Counties, northern New Jersey and suburban Long Island.



A Line of Electrical Instruments for Telephone Men

New York, N. Y.—The Roller-Smith company, manufacturers of electrical instruments, meters and circuit breakers, recently have published revised editions of their Bulletins No. 110 and 150. Bulletin No. 110 describes a line of small portable direct current instruments including ammeters, milli-ammeters, voltmeters, milli-voltmeters and volt-ammeters. This line comprises small instruments which are said to be light in weight, convenient, accurate and reliable, and which would be suitable for such uses as battery testing, measuring voltage drops in lines, current supply to transmitters, electrolysis measurements, etc. A large number of combinations are available in double and triple scale ranges and in combination volt and ammeters so that a single instrument can be made to serve many purposes by a careful selection of the ranges. Bulletin No. 150 describes a similar line of small alternating current instruments.

Thomas Company Issues New Circular

East Liverpool, Ohio—The R. Thomas & Sons Company, manufacturers of high-grade porcelain insulators, has just issued an attractive circular describing Thomas Quality products that are of particular use on telephone and railway signal lines. Included are guy or breakstrain insulators, line insulators, telephone knobs and telephone cleats. A copy may be had by writing the company.

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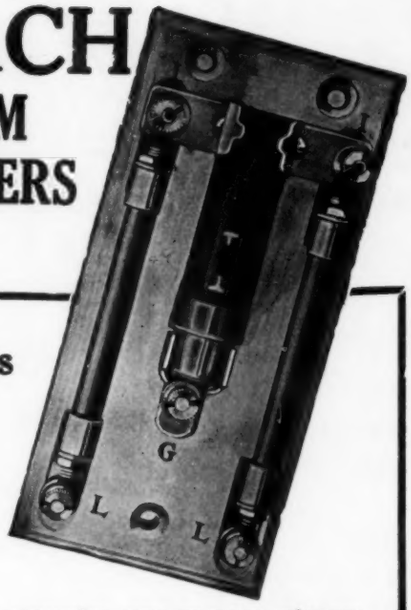

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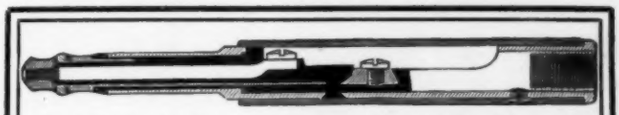

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Last Missouri County to Have Toll Service

Versailles, Mo.—Camden County, Missouri, the last county of the state to have telephone connections with the outside world, will soon lose its isolated position. The Versailles Telephone Co. of Versailles is arranging to construct a line to Linn Creek, the county seat. Construction work will be completed in the fall. Ozark County has just been connected to the outside world through the completion of a line by the West Plains Telephone Co. from West Plains to Gainesville and Dallas County had its first telephone service to outside points when the Southwestern Bell Telephone Co. built a toll line from Springfield to Buffalo about a year ago.

Westinghouse Chief Engineer Is Dead

Pittsburgh, Pa. — Benjamin G. Lamme, chief engineer of the Westinghouse Electric & Manufacturing Co., died at his home in East Liberty, Pa., on July 8th. Mr. Lamme was associated with the Westinghouse company continuously since 1889 and achieved an international reputation for his work in the development of electrical power apparatus, particularly the synchronous converter and electric railway equipment.

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England Installs Exclusive Repeater Station

London, Eng.—The first station to be erected exclusively for telephone repeaters was opened for service on June 2nd when the London-Bristol cable was completed. This station located at Taplow, says "Electrical Review," is really an independent electric power station combined with the telephone repeater apparatus. The prime movers are 75 h.p. semi-Diesel engines, direct connected to two generators in tandem. These generators furnish current for charging 24 volt and 150 volt storage batteries. The cable itself contains 616 wires furnishing 462 channels of communication. It is placed underground in clay ducts and is loaded at distances of 2000 yards. This cable will provide communication between London and the west of England and will also be available as an emergency route to the north of England in case of failure of cable on one of the other routes. Some of the lines in the cable are designed so that they may form part of a general European communication network at some future time.